Supporting Information

Machine learning-guided search for high-efficiency perovskite solar cells with doped electron transport layers

*Chenlong She[&a], Qicheng Huang[&a], Cong Chen[a,b], Yue Jiang[a], Zhen Fan[*a], Jinwei Gao[*a]*

[a] Institute for Advanced Materials, South China Academy of Advanced Optoelectronics, and Guangdong Provincial Key Laboratory of Optical Information Materials and Technology, South China Normal University, Guangzhou 510006, China.

[b] Department of Mechanical Engineering, The University of Hong Kong, Pokfulam Rd., Pokfulam, Hong Kong, China.

S1 Datasets used in this work

By surveying 880 articles published between 2013 and 2020, 2006 experimental data points were extracted from these articles and used to construct the datasets.

The first dataset used for the first-step ML was composed of 1820 PSCs performance data points extracted from 795 articles published in 2013-2020. As the key performance metric of a PSC, PCE was chosen as target attribute. Nine major factors influencing the PCE were chose as features, which were perovskite type, ETL and second layer of ETL/ETL interlayer (ETL-2) materials, deposition procedure and method, perovskite precursor solvent, anti-solvent, HTL materials and additive. The details of the original dataset are given in **Table S1**. In the calculation, in order to avoid the over-fitting and improve the model performance, we simplified the dataset by reducing the number of variables, i.e., variables that appear less than or equal to 5 times in each feature were classified into "other" (See **Table S2** for details).

The second dataset used for the second-step ML containing PSCs with doped ETLs. This dataset contains 90 data points of doped-SnO_2-based PSCs collected from 36 articles and 96 data points of doped-TiO2-based PSCs collected from 49 articles. We took the efficiency improvement ratio (EIR) as the target attribute. An EIR induced by the ETL doping was obtained by dividing the PCE of a doped-ETL-based PSC by that of the corresponding undoped-ETL-based PSC. We set the doping element and concentration, the physical and chemical properties of the doping element such as atomic number (AN), ionic radius (IR/[pm]), ionic charge (IC), ionization energy (IE/[$kJ \cdot mol^{-1}$]), electron

affinity (EA/[kJ·mol^{-1}]), electronegativity (Paulingscales), electron numbers of s, p, d, f orbits (S/P/D/F orbit) and sum of s and p orbital radii (SP orbit/[pm]), and the optical and electrical properties of ETL after doping like Fermi level, CBM, bandgap and conductivity as the features (See **Tables S3-S5** for details). These data were obtained from the website https://www.webelements.com/. **Figure S1** shows all the doping elements for the TiO_2 and SnO_2 ETLs.

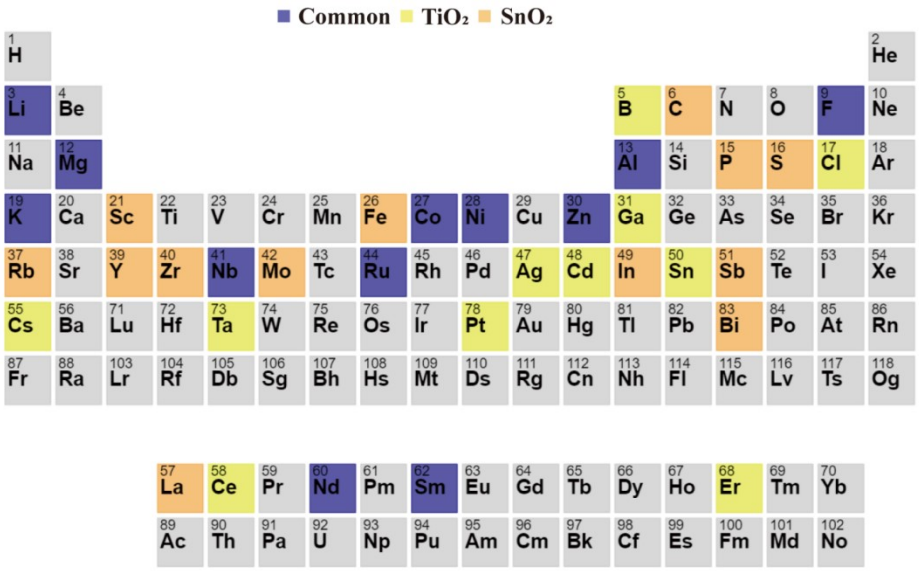

Figure S1. Doping elements used for the TiO_2 and SnO_2 ETLs. Some elements are doped only in SnO_2 or TiO_2, while some other elements are doped in both.

Table S1. First-step ML dataset containing undoped-ETL-based PSCs.

Article	Year	ETL	ETL-2	Perovskite	Deposition procedure	Deposition method	Anti-solvent treatment	Precursor solution	HTL	HTL additive	PCE/[%]
Abrusci, A. et al., Nano Lett. 13, 3124–3128 (2013)	2013	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	PCPDTBT	no	6.8
Abrusci, A. et al., Nano Lett. 13, 3124–3128 (2013)	2013	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	6.7
Abrusci, A. et al., Nano Lett. 13, 3124–3128 (2013)	2013	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	3.8
Abrusci, A. et al., Nano Lett. 13, 3124–3128 (2013)	2013	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.8
Abrusci, A. et al., Nano Lett. 13, 3124–3128 (2013)	2013	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.7
Abrusci, A. et al., Nano Lett. 13, 3124–3128 (2013)	2013	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.2
Ball, J. M. et al., Energy Environ. Sci. 6, 1739 (2013)	2013	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.3
Bi, D. et al., J. Phys. Chem. Lett. 4, 1532–1536 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	DEH	Li+TBP	1.6
Bi, D. et al., J. Phys. Chem. Lett. 4, 1532–1536 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	P3HT	Li+TBP	4.5

Bi, D. et al., J. Phys. Chem. Lett. 4, 1532–1536 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	8.5
Bi, D. et al., Nanoscale 5, 11686 (2013)	2013	ZnO	ZnO-nanorod	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	5
Burschka, J. et al., Nature 499, 316–319 (2013)	2013	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15
Cai, B. et al., Energy Environ. Sci. 6, 1480 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	PCBTDPP	no	5.6
Cai, B. et al., Energy Environ. Sci. 6, 1480 (2013)	2013	TiO2	mTiO2	MAPbBr3	one-step	spin	no	GBL	PCBTDPP	no	3
Cai, B. et al., Energy Environ. Sci. 6, 1480 (2013)	2013	TiO2	mTiO2	MAPbBr3	one-step	spin	no	GBL	P3HT	no	0.8
Chen, H. et al., Chem. Commun. 49, 7277 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	P3HT	Li+TBP	6.5
Chen, H. et al., Chem. Commun. 49, 7277 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	P3HT	Li+TBP	4.1
Colella, S. et al., Chem. Mater. 25, 4613–4618 (2013)	2013	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.4
Colella, S. et al., Chem. Mater. 25, 4613–4618 (2013)	2013	TiO2	0	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	4.8
Dharani, S. et al., Nanoscale 6, 1675–1679 (2014)	2013	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	3.1

Dharani, S. et al., Nanoscale 6, 1675–1679 (2014)	2013	TiO2	TiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.8
Edri, E. et al., J. Phys. Chem. Lett. 4, 897–902 (2013)	2013	TiO2	mAl2O3	MAPbBr3	one-step	spin	no	DMF	PCBM	no	0.7
Edri, E. et al., J. Phys. Chem. Lett. 4, 897–902 (2013)	2013	TiO2	mAl2O3	MAPbBr3	one-step	spin	no	DMF	TPD	no	0.7
Edri, E. et al., J. Phys. Chem. Lett. 4, 897–902 (2013)	2013	TiO2	mAl2O3	MAPbBr3	one-step	spin	no	DMF	PDI	no	0.6
Edri, E. et al., J. Phys. Chem. Lett. 4, 897–902 (2013)	2013	TiO2	mTiO2	MAPbBr3	one-step	spin	no	DMF	PDI	no	0.5
Edri, E. et al., J. Phys. Chem. Lett. 4, 897–902 (2013)	2013	TiO2	mAl2O3	MAPbBr3	one-step	spin	no	DMF	P3HT	no	0.5
Heo, J. H. et al., Nat. Photonics 7, 486–491 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	no	no	2.5
Heo, J. H. et al., Nat. Photonics 7, 486–491 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	PCPDTBT	no	5.3
Heo, J. H. et al., Nat. Photonics 7, 486–491 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	PCDTBT	no	4.2
Heo, J. H. et al., Nat. Photonics 7, 486–491 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	PTAA	no	12
Heo, J. H. et al., Nat. Photonics 7, 486–491 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	P3HT	Li+TBP	6.7

Heo, J. H. et al., Nat. Photonics 7, 486–491 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP	8.4
Jeon, N. J. et al., J. Am. Chem. Soc. 135, 19087–19090 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	no	no	8
Jeon, N. J. et al., J.Am. Chem. Soc. 135, 19087–19090 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	Py-C	Li+TBP+FK 269	12.4
Jeon, N. J. et al., J. Am. Chem. Soc. 135, 19087–19090 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP+FK 269	12.7
Shi, J. J. et al., Chinese Phys. Lett. 30, 128402 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	5.1
Shi, J. J. et al., Chinese Phys. Lett. 30, 128402 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	3.3
Kim, H. S. et al., Nano Lett. 13, 2412–2417 (2013)	2013	TiO2	TiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	9.4
Kumar, M. H. et al., Chem. Commun. 49, 11089 (2013)	2013	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	5.5
Kumar, M. H. et al., Chem. Commun. 49, 11089 (2013)	2013	ZnO	ZnO-nanorod	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	8.9
Laban, W. A. and Etgar, L., Energy Environ. Sci. 6, 3249 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	no	no	8
Bi, D. et al., RSC Adv. 3, 18762 (2013)	2013	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.5

Bi, D. et al., RSC Adv. 3, 18762 (2013)	2013	TiO2	mZrO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.8
Liu, M. et al., Nature 501, 395–398 (2013)	2013	TiO2	0	MAPbI3-xClx	one-step	CVD	no	na	spiro-OMeTAD	Li+TBP	15.4
Liu, M. et al., Nature 501, 395–398 (2013)	2013	TiO2	0	MAPbI3-xClx	one-step	spin	no	na	spiro-OMeTAD	Li+TBP	8.6
Liu, D. and Kelly, T. L., Nat. Photonics 8, 133–138 (2013)	2013	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15.7
Noh, J. H. et al., Nano Lett. 13, 1764–1769 (2013)	2013	TiO2	mTiO2	MAPbI3-xBrx	one-step	spin 2-3	no	DMF+GBL	PTAA	Li+TBP	12.3
Noh, J. H. et al., J. Mater. Chem. A 1, 11842 (2013)	2013	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP+FK 209	10.4
Qiu, J. et al., Nanoscale 5, 3245 (2013)	2013	TiO2	TiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	4.3
Qiu, J. et al., Nanoscale 5, 3245 (2013)	2013	TiO2	TiO2	MAPbI2Br	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	4.9
Zhang, W. et al., Nano Lett. 13, 4505–4510 (2013)	2013	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.7
Zhang, W. et al., Nano Lett. 13, 4505–4510 (2013)	2013	TiO2	Au@SiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.4
Abate, A. et al., Nano Lett. 14, 3247–3254-2014	2014	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.7

Abate, A. et al., Nano Lett. 14, 3247–3254 (2014)	2014	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13
Abate, A. et al., Nano Lett. 14, 3247–3254 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.1
Abate, A. et al., Nano Lett. 14, 3247–3254 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	3.8
Aharon, S. et al., Phys. Chem. Chem. Phys. 16, 10512–10518 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	na	no	no	10.9
Aharon, S. et al., J. Phys. Chem. C 118, 17160–17165 (2014)	2014	TiO2	mTiO2	MAPbBr3	two-step	spin-dip	no	DMF	no	no	1.7
Aharon, S. et al., J. Phys. Chem. C 118, 17160–17165 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	7.2
Aharon, S. et al., J. Phys. Chem. C 118, 17160–17165 (2014)	2014	TiO2	mTiO2	MAPbI3-xBrx	two-step	spin-dip	no	DMF	no	no	8.5
Badia, L. et al., APL Mater. 2, 081507 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.2
Badia, L. et al., APL Mater. 2, 081507 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+Ir	10.8
Bera, A. et al., J. Phys. Chem. C 118, 28494–28501 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.8
Bera, A. et al., J. Phys. Chem. C 118, 28494–28501 (2014)	2014	TiO2	Msto	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.6

Chandiran, A. K. et al., Adv. Mater. 26, 4309–4312 (2014)	2014	0	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.5
Chandiran, A. K. et al., Adv. Mater. 26, 4309–4312 (2014)	2014	0	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	7.2
Chavhan, S. et al., J. Mater. Chem. A 2, 12754–12760 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin 2-3	no	DMF	CuSCN	no	6.4
Chen, Q. et al., Nano Lett. 14, 4158–4163 (2014)	2014	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	12
Chen, Q. et al., J. Am. Chem. Soc. 136, 622–625 (2014)	2014	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	12.1
Choi, H. et al., Chem. - A Eur. J. 20, 10894–10899 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	6.9
Choi, H. et al., Chem. - A Eur. J. 20,10894–10899 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	OMeTPA-FA	no	11.1
Choi, H. et al., Chem. - A Eur. J. 20, 10894–10899 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	OMeTPA-FA	Li+TBP	12.4
Choi, H. et al., Chem. - A Eur. J. 20, 10894–10899 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	OMeTPA-TPA	Li+TBP	11
Choi, H. et al., Chem. - A Eur. J. 20, 10894–10899 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	OMeTPA-FA	Li+TBP+FK 209	13.6
Choi, H. et al., Chem. - A Eur. J. 20, 10894–10899 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	OMeTPA-TPA	Li+TBP+FK 209	12.3

Choi, H. et al., Chem. - A Eur. J. 20, 10894–10899 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	14.7
Christians, J. A. et al., J. Am. Chem. Soc. 136, 758–764 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	7.9
Christians, J. A. et al., J. Am. Chem. Soc. 136, 758–764 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	CuI	no	6
Colella, S. et al., J. Phys. Chem. Lett. 5, 3532–3538 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.2
Conings, B. et al., APL Mater. 2, 081505 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMSO	P3HT	no	13.6
Conings, B. et al., Adv. Mater. 26, 2041–2046 (2014)	2014	TiO2	0	MAPbI2Cl	one-step	spin	no	DMF	P3HT	no	11.4
Ding, Y. et al., J. Power Sources 272, Ahead of Print (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	4.5
Ding, Y. et al., J. Power Sources 272, Ahead of Print (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF+PVP	spiro-OMeTAD	Li+TBP	8.7
Do, K. et al., Chem. Commun. 50, 10971–10974 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	Triazine-Th-OMeTPA	Li+TBP+FK 102	12.5
Do, K. et al., Chem. Commun. 50, 10971–10974 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	Triazine-Ph-OMeTPA	Li+TBP+FK 102	10.9
Do, K. et al., Chem. Commun. 50, 10971–10974 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	13.5

Edri, E. et al., J. Phys. Chem. Lett. 5, 429–433 (2014)	2014	TiO2	mAl2O3	MAPbBr3	one-step	spin 2-3	no	DMF	CBP	Li+TBP	0.4
Edri, E. et al., J. Phys. Chem. Lett. 5, 429–433 (2014)	2014	TiO2	mAl2O3	MAPbBr3-xClx	one-step	spin 2-3	no	DMF	CBP	Li+TBP	2.7
Edri, E. et al., J.Phys. Chem. Lett. 5, 429–433 (2014)	2014	TiO2	mAl2O3	MAPbBr3-xClx	one-step	spin 2-3	no	DMF	CBP	TBP	0.4
Eperon, G. E. et al., Energy Environ. Sci. 7, 982 (2014)	2014	TiO2	0	FAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.2
Etgar, L. et al., J. Mater. Chem. A 2, 11586–11590 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	3
Etgar, L. et al., J. Mater. Chem. A 2, 11586–11590 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	PbS QDs	no	3.6
Di Giacomo, F. et al., J. Power Sources 251, 152–156 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	Li+TBP	9.3
Di Giacomo, F. et al., J. Power Sources 251, 152–156 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.6
Guo, Y. et al., J. Mater. Chem. A 2, 13827–13830 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	9.2
Guo, Y. et al., J. Mater. Chem. A 2, 13827–13830 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	Li	11.2
Guo, Y. et al., J. Mater. Chem. A 2, 13827–13830 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	Li+D-TBP	12.4

Guo, Y. et al., J. Mater. Chem. A 2, 13827–13830 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	D-TBP	9.1
Hanusch, F. C. et al., J. Phys. Chem. Lett. 5, 2791–2795 (2014)	2014	TiO2	0	MAPbBr3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	0.4
Hanusch, F. C. et al., J. Phys. Chem. Lett. 5, 2791–2795 (2014)	2014	TiO2	0	FAPbBr3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	6.5
Hao, F. et al., Nat. Photonics 8, 489–494 (2014)	2014	TiO2	mTiO2	MASnIBr2	one-step	spin	no	DMF	spiro-OMeTAD	Li+2,6lutidine	6
Hao, F. et al., Nat. Photonics 8, 489–494 (2014)	2014	TiO2	mTiO2	MASnI2Br	one-step	spin	no	DMF	spiro-OMeTAD	Li+2,6lutidine	5.6
Hao, F. et al., Nat. Photonics 8, 489–494 (2014)	2014	TiO2	mTiO2	MASnI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+2,6lutidine	5.4
Hao, F. et al., Nat. Photonics 8, 489–494 (2014)	2014	TiO2	mTiO2	MASnBr3	one-step	spin	no	DMF	spiro-OMeTAD	Li+2,6lutidine	4.5
Hao, F. et al., J. Am. Chem. Soc. 136, 8094–8099 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+2,6lutidine	8.3
Hao, F. et al., J. Am. Chem. Soc. 136, 8094–8099 (2014)	2014	TiO2	mTiO2	MASn0.25Pb 0.75I3	one-step	spin	no	DMF	spiro-OMeTAD	Li+2,6lutidine	7.4
Hao, F. et al., J. Am. Chem. Soc. 136,8094–8099 (2014)	2014	TiO2	mTiO2	MASn0.5Pb0 .5I3	one-step	spin	no	DMF	spiro-OMeTAD	Li+2,6lutidine	7.3
Hao, F. et al., J. Am. Chem. Soc. 136, 8094–8099 (2014)	2014	TiO2	mTiO2	MASn0.75Pb 0.25I3	one-step	spin	no	DMF	spiro-OMeTAD	Li+2,6lutidine	3.7

Hao, F. et al., J. Am. Chem. Soc. 136, 8094–8099 (2014)	2014	TiO2	mTiO2	MASnI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+2,6lutidine	5.4
Hao, F. et al., J. Am. Chem. Soc. 136, 16411–16419 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	no	no	6.4
Hao, F. et al., J. Am. Chem. Soc. 136, 16411–16419 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	vasp	no	DMF	no	no	10.6
Hu, Q. et al., ACS Nano 8, 10161–10167 (2014)	2014	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14.2
Hu, Q. et al., ACS Nano 8, 10161–10167 (2014)	2014	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.6
Hu, Q. et al., ACS Nano 8, 10161–10167 (2014)	2014	Cs2CO3	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15.1
Huang, F. et al., Nano Energy 10, 10–18 (2014)	2014	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	17
Huang, F. et al., Nano Energy 10, 10–18 (2014)	2014	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	5.7
Huang, F. et al., Nano Energy 10, 10–18 (2014)	2014	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.4
Huang, F. et al., Nano Energy 10, 10–18 (2014)	2014	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.6
Huang, F. et al., Nano Energy 10, 10–18 (2014)	2014	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	4.3

Ito, S. et al., ChemPhysChem 15, 1194–1200 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	1.4
Ito, S. et al., ChemPhysChem 15, 1194–1200 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	0.8
Ito, S. et al., ChemPhysChem 15, 1194–1200 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	CuSCN	no	4.9
Ito, S. et al., ChemPhysChem 15, 1194–1200 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	CuSCN	no	1.8
Ito, S. et al., J. Phys. Chem. C 118, 16995–17000 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	CuSCN	no	5.1
Ito, S. et al., J. Phys. Chem. C 118, 16995–17000 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	CuSCN	no	4.8
Jeon, N. J. et al., Nat. Mater. 13, 897–903 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	18
Jeon, N. J. et al., J. Am. Chem. Soc. 136, 7837–7840 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	15.2
Jeon, N. J. et al., J. Am. Chem. Soc. 136, 7837–7840 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	14.9
Jeon, N. J. et al., J. Am. Chem. Soc. 136, 7837–7840 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	13.9
Jeon, N. J. et al., Nat. Mater. 13, 897–903 (2014)	2014	TiO2	0	MAPbI3-xBrx	one-step	spin 2-3	toluene	DMSO+GBL	PTAA	no	15.8

Jeon, N. J. et al., Nat. Mater. 13, 897–903 (2014)	2014	TiO2	mTiO2	MAPbI3-xBrx	one-step	spin 2-3	toluene	DMSO+GBL	PTAA	no	16.7
Juarez-Perez, E. J. et al., J. Phys. Chem. Lett. 5, 680–685 (2014)	2014	0	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	0.1
Juarez-Perez, E. J. et al., J. Phys. Chem. Lett. 5, 680–685 (2014)	2014	ZnO	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	1.8
Juarez-Perez, E. J. et al., J. Phys. Chem. Lett. 5, 680–685 (2014)	2014	CdS	mAl2O3	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	1.5
Juarez-Perez, E. J. et al., J. Phys. Chem. Lett. 5, 680–685 (2014)	2014	0	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	5
Juarez-Perez, E. J. et al., J. Phys. Chem. Lett. 5, 680–685 (2014)	2014	ZnO	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.1
Juarez-Perez, E. J. et al., J. Phys. Chem. Lett. 5, 680–685 (2014)	2014	ZnO	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	7.9
Ke, W. et al., ACS Appl. Mater. Interfaces 6, 15959–15965 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15.1
Koh, T. M. et al., ChemSusChem 7, 1909–1914 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	11

Koh, T. M. et al., ChemSusChem 7, 1909–1914 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+MY11	11.9
Krishna, A. et al., Chem. Sci. 5, 2702–2709 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	4.7
Krishna, A. et al., Chem. Sci. 5, 2702–2709 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	T1no3	Li+TBP+FK102	12.4
Krishna, A. et al., Chem. Sci. 5, 2702–2709 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	T1no2	Li+TBP+FK102	12.2
Krishna, A. et al., Chem. Sci. 5, 2702–2709 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	T1no1	Li+TBP+FK102	8.4
Krishna, A. et al., Chem. Sci. 5, 2702–2709 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK102	12.9
Krishnamoorthy, T. et al., J. Mater. Chem. A 2, 6305–6309 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	KTM3	no	7.3
Krishnamoorthy, T. et al., J. Mater. Chem. A 2, 6305–6309 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	KTM3	Li+TBP+FK102	8.7
Krishnamoorthy, T. et al., J. Mater. Chem. A 2, 6305–6309 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	KTM3	Li+TBP+FK209	11
Krishnamoorthy, T. et al., J. Mater. Chem. A 2, 6305–6309 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK209	11.4

Kwon, Y. S. et al., Energy Environ. Sci. 7, 1454 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	PDPPDBTE	no	9.2
Kwon, Y. S. et al., Energy Environ. Sci. 7, 1454 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	P3HT	Li+TBP	6.3
Kwon, Y. S. et al., Energy Environ. Sci. 7, 1454 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP	7.6
Lee, J.-W. et al., ChemPhysChem 15, 2595–2603 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMA	PTB-DCB21	no	8.7
Lee, J.-W. et al., ChemPhysChem 15, 2595–2603 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMA	PTB-BO	no	7.4
Lee, J.-W. et al., ChemPhysChem 15, 2595–2603 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMA	spiro-OMeTAD	no	7
Lee, J.-W. et al., ChemPhysChem 15, 2595–2603 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMA	PTB-DCB21	Li+TBP	9.5
Lee, J.-W. et al., ChemPhysChem 15, 2595–2603 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMA	spiro-OMeTAD	Li+TBP	11.6
Lee, J. W. et al., Adv. Mater. 26, 4991–4998 (2014)	2014	TiO2	mTiO2	FAPbI3	two-step	spin 2-3-dip	no	DMF	spiro-OMeTAD	Li+TBP	16
Lee, J.-W. et al., J. Mater. Chem. A 2, 9251 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMA	spiro-OMeTAD	Li+TBP	9
Lee, J.-W. et al., J. Mater. Chem. A 2, 9251 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMA	spiro-OMeTAD	Li+TBP	14.5

Leijtens, T. et al., J. Phys. Chem. Lett. 5, 1096–1102 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.6
Li, H. et al., Angew. Chemie - Int. Ed. 53, 4085–4088 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	na	H1no1	Li+TBP	11.1
Li, H. et al., Angew. Chemie - Int. Ed. 53, 4085–4088 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	na	H1no1	Li+TBP+FK 102	13.8
Li, H. et al., Angew. Chemie - Int. Ed. 53, 4085–4088 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	na	spiro-OMeTAD	Li+TBP+FK 102	13.7
Li, Z. et al., ACS Nano 8, 6797–6804 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	6.9
Li, Z. et al., ACS Nano 8, 6797–6804 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	5.1
Li, Z. et al., ACS Nano 8, 6797–6804 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	9.9
Li, W. et al., J. Mater. Chem. A 2, 13587–13592 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.9
Li, W. et al., J. Mater. Chem. A 2, 13587–13592 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9
Liang, L. et al., ACS Appl. Mater. Interfaces 6, 20585–20589 (2014)	2014	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.4
Liang, L. et al., ACS Appl. Mater. Interfaces 6, 20585–20589 (2014)	2014	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	7

Liu, J. et al., Energy Environ. Sci. 7, 2963–2967 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	TTF-1	no	11
Liu, J. et al., Energy Environ. Sci. 7, 2963–2967 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	P3HT	no	6.2
Liu, J. et al., Energy Environ. Sci. 7, 2963–2967 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	no	6.2
Liu, J. et al., Energy Environ. Sci. 7, 2963–2967 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	TTF-1	Li+TBP	4.4
Liu, J. et al., Energy Environ. Sci. 7,2963–2967 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	P3HT	Li+TBP	6.7
Liu, J. et al., Energy Environ. Sci. 7, 2963–2967 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.4
Liu, D., Yang, J. and Kelly, T. L., J. Am. Chem. Soc. 136, 17116–17122 (2014)	2014	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	P3HT	Li+TBP	11.7
Liu, D., Yang, J. and Kelly, T. L., J. Am. Chem. Soc. 136, 17116–17122 (2014)	2014	no	no	MAPbI3	two-step	spin-dip	no	DMF	P3HT	Li+TBP	11.6
Liu, D., Yang, J. and Kelly, T. L., J. Am. Chem. Soc. 136, 17116–17122 (2014)	2014	ZnO	no	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14.7
Liu, D., Yang, J. and Kelly, T. L., J. Am. Chem. Soc. 136, 17116–17122 (2014)	2014	no	no	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.5

Lv, S. et al., Chem. Commun. 50, 6931 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	HTM2	no	11.6
Lv, S. et al., Chem. Commun. 50, 6931 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	HTM1	no	11.3
Mahmood, K. et al., Nanoscale 6, 9127 (2014)	2014	ZnO	mZnO	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.9
Mahmood, K. et al., Nanoscale 6, 9127 (2014)	2014	ZnO-Al	m-Al-ZnO	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.2
Manseki, K. et al., RSC Adv. 4, 9652–9655 (2014)	2014	TiO2	TiO2	MAPbI3	one-step	spin 2-3	no	GBL	P3HT	Li+TBP	4.2
Manseki, K. et al., RSC Adv. 4, 9652–9655 (2014)	2014	TiO2	TiO2	MAPbI3	one-step	spin 2-3	no	GBL	P3HT	Li+TBP	3.1
Moehl, T. et al., J. Phys. Chem. Lett. 5, 3931–3936 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	17.1
Moehl, T. et al., J. Phys. Chem. Lett. 5, 3931–3936 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14.6
Nagarjuna, P. et al., Electrochim. Acta 151, 21–26 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	no	no	2.7
Nagarjuna, P. et al., Electrochim. Acta 151, 21–26 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	copolymerP	no	6.6
Nagarjuna, P. et al., Electrochim. Acta 151, 21–26 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	P3HT	no	4.2

Nguyen, W. H. et al., J. Am. Chem. Soc.136, 10996–11001 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.5
Nguyen, W. H. et al., J. Am. Chem. Soc. 136, 10996–11001 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	spiro(TFSI)2 +TBP	10.6
Niu, G. et al., J. Mater. Chem. A 2, 705–710 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	4.7
Niu, G. et al., J. Mater. Chem. A 2, 705–710 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	4.6
Noel, N. K. et al., ACS Nano 8, 9815–9821 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.5
Noel, N. K. et al., ACS Nano 8, 9815–9821 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.3
Noel, N. K. et al., ACS Nano 8, 9815–9821 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.1
Noel, N. K. et al., Energy Environ. Sci. 7, 3061–3068 (2014)	2014	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	H+TBP	15
Noel, N. K. et al., Energy Environ. Sci. 7, 3061–3068 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	H+TBP	11.5
Noel, N. K. et al., Energy Environ. Sci. 7, 3061–3068 (2014)	2014	TiO2	mTiO2	MASnI3	one-step	spin	no	DMF	spiro-OMeTAD	H+TBP	6.4
Ogomi, Y. et al., J. Phys. Chem. Lett. 5, 1004–1011 (2014)	2014	TiO2	mTiO2	MASn1-xPbxI3	one-step	spin	no	DMF	P3HT	no	4.2

Ogomi, Y. et al., J. Phys. Chem. Lett. 5, 1004–1011 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12
Ogomi, Y. et al., in ChemPhysChem 15, 1062–1069 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.5
Ogomi, Y. et al., in ChemPhysChem 15, 1062–1069 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7
Ogomi, Y. et al., in ChemPhysChem 15, 1062–1069 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.6
Pang, S. et al., Chem. Mater. 26, 1485–1491 (2014)	2014	TiO2	mTiO2	FAPbI3	one-step	spin	no	DMF	P3HT	no	3.7
Pang, S. et al., Chem. Mater. 26, 1485–1491 (2014)	2014	TiO2	mTiO2	FAPbI3	two-step	spin-dip	no	DMF	P3HT	no	7.5
Pathak, S. K. et al., Adv. Funct. Mater. 24, 6046–6055 (2014)	2014	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.8
Pathak, S. K. et al., Adv. Funct. Mater. 24, 6046–6055 (2014)	2014	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.1
Pellet, N. et al., Angew. Chemie - Int. Ed. 53, 3151–3157 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.5
Pellet, N. et al., Angew. Chemie - Int. Ed. 53, 3151–3157 (2014)	2014	TiO2	mTiO2	FAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11

Pellet, N. et al., Angew. Chemie - Int. Ed. 53, 3151–3157 (2014)	2014	TiO2	mTiO2	(MA)0.6(FA)0.4PbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14.9
Qin, P. et al., Nat. Commun. 5, 3834 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin 2-3-dip	no	DMF	no	no	6.7
Qin, P. et al., Nat. Commun. 5, 3834 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	3.8
Qin, P. et al., Nat. Commun. 5, 3834 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin 2-3-dip	no	DMF	CuSCN	no	12.4
Qin, P. et al., Nat. Commun. 5, 3834 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	CuSCN	no	11.2
Qin, P. et al., J. Am. Chem. Soc. 136, 8516–8519 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	7.7
Qin, P. et al., J. Am. Chem. Soc. 136, 8516–8519 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	Fused-F	no	12.8
Qin, P. et al., J. Am. Chem. Soc. 136, 8516–8519 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.7
Qin, P. et al., Nanoscale 6, 1508–1514 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	10.6
Qin, P. et al., Nanoscale 6, 1508–1514 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	11.4
Ramos, F. J. et al., ChemPhysChem 15, 1148–1153 (2014)	2014	TiO2	ZnO-nanocolumn	MAPbI3	two-step	spin-dip	no	DMF	PTAA	Li+TBP	1.3

Ramos, F. J. et al., ChemPhysChem 15, 1148–1153 (2014)	2014	TiO2	ZnO-nanocolumn	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK209	4.8
Ryu, S. et al., Energy Environ. Sci. 7, 2614–2618 (2014)	2014	TiO2	mTiO2	MAPbBr3	one-step	spin 2-3	toluene	DMF+GBL	PIF8-TAA	Li+TBP	6.7
Ryu, S. et al., Energy Environ. Sci. 7, 2614–2618 (2014)	2014	TiO2	mTiO2	MAPbBr3	one-step	spin 2-3	toluene	DMF+GBL	PF8-TAA	Li+TBP	6
Ryu, S. et al., Energy Environ. Sci. 7, 2614–2618 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMF+GBL	PIF8-TAA	Li+TBP	9.1
Ryu, S. et al., Energy Environ. Sci. 7, 2614–2618 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMF+GBL	PF8-TAA	Li+TBP	4.6
Ryu, S. et al., Energy Environ. Sci. 7, 2614–2618 (2014)	2014	TiO2	mTiO2	MAPbBr3	one-step	spin 2-3	toluene	DMF+GBL	PTAA	Li+TBP	5.9
Ryu, S. et al., Energy Environ. Sci. 7, 2614–2618 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMF+GBL	PTAA	Li+TBP	16.2
Sarkar, A. et al., J. Phys. Chem. C 118, 16688–16693 (2014)	2014	TiO2	mTiO2	MAPb(I0.9Br0.1)3	one-step	spin 2-3	no	GBL	PTAA	no	12.8
Shi, J. et al., Appl. Phys. Lett. 104, 063901 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	10.5
Shi, J. et al., ACS Appl. Mater. Interfaces 6, 9711–9718 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin 2-3-dip	no	DMF	no	no	10.5
Son, D.-Y. et al., J. Phys. Chem. C 118, 16567–16573 (2014)	2014	TiO2	TiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10

Son, D.-Y. et al., J. Phys. Chem. C 118, 16567–16573 (2014)	2014	ZnO	ZnO-nanorod	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.1
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	mTiO2	MAPbBr3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	1.4
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	mAl2O3	MAPbBr3-xClx	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	3.2
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	mTiO2	MAPbBr3-xClx	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	2.9
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	6.5
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	mAl2O3	MAPbI3-xBrx	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	4.5
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	mTiO2	MAPbI3-xBrx	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	2.9
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	11.1
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	12.5
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	10.9
Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	0	MAPb(I1-xBrx)3-yCly	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	3.9

Suarez, B. et al., J. Phys. Chem. Lett. 5, 1628–1635 (2014)	2014	TiO2	mTiO2	MAPb(I1-xBrx)3-yCly	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	9.1
Wang, J. T. W. et al., Nano Lett. 14, 724–730 (2014)	2014	0	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	3.7
Wang, J. T. W. et al., Nano Lett. 14, 724–730 (2014)	2014	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.1
Wang, J. T. W. et al., Nano Lett. 14, 724–730 (2014)	2014	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.6
Wang, J. T. W. et al., Nano Lett. 14, 724–730 (2014)	2014	graphe ne	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	5.9
Wang, X. et al., Mater. Sci. Semicond. Process. 27, 569–576 (2014)	2014	0	mTiO2	MAPbI3	one-step	spin	no	GBL	P3HT	Li+TBP	1.3
Wang, X. et al., Mater. Sci. Semicond. Process. 27, 569–576 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	P3HT	Li+TBP	3.2
Wang, J. et al., Chem. Commun. 50, 5829 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	2TPA-2-DP	no	9.1
Wang, J. et al., Chem. Commun. 50, 5829 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	10.2
Wojciechowski, K. et al., Energy Environ. Sci. 7, 1142–1147 (2014)	2014	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.9
Wu, Y. et al., Appl. Phys. Express 7, 052301 (2014)	2014	0	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	0.3

Wu, Y. et al., Appl. Phys. Express 7, 052301 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.6
Xiao, M. et al., Angew. Chemie 126, 10056–10061 (2014)	2014	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	16.2
Xiao, M. et al., Angew. Chemie 126, 10056–10061 (2014)	2014	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	1.8
Xiao, J. et al., RSC Adv. 4, 32918 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	PNBA	no	11.4
Xu, Y. et al., ACS Appl. Mater. Interfaces 6, 5651–5656 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin 2-3-dip	no	DMF	no	no	6.7
Xu, Y. et al., ACS Appl. Mater. Interfaces 6, 5651–5656 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin 2-3-dip	no	DMF	no	no	5.7
Yella, A. et al., Nano Lett. 14, 2591–2596 (2014)	2014	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.7
Zhang, H. et al., Chem. Commun. 50, 5020 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	na	spiro-OMeTAD	no	4
Zhang, H. et al., Chem. Commun. 50, 5020 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	na	spiro-OMeTAD	Li+TBP	8.4
Zhang, H. et al., Chem. Commun. 50, 5020 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	na	spiro-OMeTAD	BuPyIm-TFSI	8.2
Zhang, F. et al., ACS Appl. Mater. Interfaces 6, 16140–	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	8.3

16146 (2014)											
Zhao, Y. et al., Appl. Phys. Lett. 104, 213906 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.4
Zhao, Y. et al., Appl. Phys. Lett. 104, 213906 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12
Zhao, Y. et al., Appl. Phys. Lett. 104, 213906 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.4
Zhao, Y. et al., Faraday Discuss. 176, 301–312 (2014)	2014	TiO2	mTiO2	MAPbBr3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	4.1
Zhao, Y. et al., Faraday Discuss. 176, 301–312 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.2
Zhao, Y. et al., Faraday Discuss. 176, 301–312 (2014)	2014	TiO2	mTiO2	MAPbI2Br	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.8
Zhao, Y. et al., Faraday Discuss. 176, 301–312 (2014)	2014	TiO2	mTiO2	MAPbIBr2	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	4.7
Zheng, L. et al., Chem. Commun. 50, 11196–11199 (2014)	2014	TiO2	0	MAPbI3-xClx	two-step	spin-dip	no	DMF	DR3TBDTT-PDMS	no	8.8
Zheng, L. et al., Chem. Commun. 50, 11196–11199 (2014)	2014	TiO2	0	MAPbI3-xClx	two-step	spin-dip	no	DMF	DR3TBDTT	no	4.9
Zheng, L. et al., Chem. Commun. 50, 11196–11199 (2014)	2014	TiO2	0	MAPbI3-xClx	two-step	spin-dip	no	DMF	DR3TBDTT	Li+TBP	3.7

Zheng, L. et al., Chem. Commun. 50, 11196–11199 (2014)	2014	TiO2	0	MAPbI3-xClx	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	8.9
Zhou, H. et al., J. Phys. Chem. Lett. 5, 3241–3246 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	9.1
Zhou, H. et al., Science 345, 542-546 (2014)	2014	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	19.3
Zhu, Z. et al., J. Am. Chem. Soc. 136, 3760–3763 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	8.8
Zhu, Z. et al., J. Am. Chem. Soc. 136, 3760–3763 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	10.2
Zhu, Z. et al., Adv. Funct. Mater. 24, 7357–7365 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	TFB	Li+TBP	10.9
Zhu, Z. et al., Adv. Funct. Mater. 24, 7357–7365 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	PFB	Li+TBP	8
Zhu, Z. et al., Adv. Funct. Mater. 24, 7357–7365 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	PFO	Li+TBP	1.2
Zhu, Z. et al., Adv. Funct. Mater. 24, 7357–7365 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	TFB	Li+TBP	12.8
Zhu, Z. et al., Adv. Funct. Mater. 24, 7357–7365 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	PFB	Li+TBP	8.8
Zhu, Z. et al., Adv. Funct. Mater. 24, 7357–7365 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	PFO	Li+TBP	1.6

Zhu, Z. et al., Adv. Funct. Mater. 24, 7357–7365 (2014)	2014	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.8
Zhu, Z. et al., Adv. Funct. Mater. 24, 7357–7365 (2014)	2014	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.6
Adli, H. K. et al., J. Phys. Chem. C 119, 22304–22309 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	8.8
Aharon, S. et al., J. Mater. Chem. A 3, 9171–9178 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	7.7
Aharon, S. et al., J. Mater. Chem. A 3, 9171–9178 (2015)	2015	TiO2	mTiO2	FAPbI3	two-step	spin-dip	no	DMF	no	no	3.9
Ahn, N. et al., J. Am. Chem. Soc. 137, 8696–8699 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.7
Bansode, U. et al., J. Phys. Chem. C 119, 9177–9185 (2015)	2015	ZnO	0	MAPbI3-xClx	one-step	PLD	no	na	spiro-OMeTAD	Li+TBP	7.7
Bera, A. et al., ACS Appl. Mater. Interfaces 7, 12404– 12411 (2015)	2015	Zn2SnO4	mZn2SnO 4	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.3
Bera, A. et al., ACS Appl. Mater. Interfaces 7, 12404– 12411 (2015)	2015	TiO2	mZn2Sn O4	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.1
Bi, H. and Zhang, Y., Mater. Lett. 161, 767–769 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	PCBM	no	5.1
Bi, H. and Zhang, Y., Mater. Lett. 161, 767–769 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	PCBM	Li+TBP	9.7

Bi, D. et al., ACS Photonics 2, 589–594 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.9
Bu, L. et al., ACS Appl. Mater. Interfaces 7, 17776–17781 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.4
Bu, L. et al., ACS Appl. Mater. Interfaces 7, 17776–17781 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.1
Cai, B. et al., Chinese J. Catal. 36, 1183–1190 (2015)	2015	TiO2	0	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	7.9
Cai, B. et al., Cuihua Xuebao/Chinese J. Catal. 36, 1183–1190 (2015)	2015	TiO2	0	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.5
Cai, B. et al., Chinese J. Catal. 36, 1183–1190 (2015)	2015	TiO2	0	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO	spiro-OMeTAD	Li+TBP	15.1
Cai, B. et al., Chinese J. Catal. 36, 1183–1190 (2015)	2015	TiO2	0	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP	14.1
Cai, B. et al., Chinese J. Catal. 36, 1183–1190 (2015)	2015	TiO2	0	MAPbI3	one-step	spin 2-3	chlorobenzene	GBL	spiro-OMeTAD	Li+TBP	9
Cao, D. H. et al., J. Am. Chem. Soc. 137, 7843–7850 (2015)	2015	TiO2	mTiO2	(CH3(CH2)3NH3)2(MA)2Pb3I10	one-step	spin	no	DMF	no	no	3.5
Cao, D. H. et al., J. Am. Chem. Soc. 137, 7843–7850 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	2.4

Cao, D. H. et al., J. Am. Chem. Soc. 137, 7843–7850 (2015)	2015	TiO2	mTiO2	(CH3(CH2)3 NH3)2(MA)2 Pb3I10	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	4
Cao, K. et al., Nano Energy 17, 171–179 (2015)	2015	TiO2	mAl2O3	MAPbI3	two-step	infiltratio n -dip	no	DMF	no	no	15
Cao, K. et al., Nano Energy 17, 171–179 (2015)	2015	TiO2	mAl2O3	MAPbI3	two-step	infiltratio n -dip	no	DMF	no	no	11.2
Cao, J. et al., J. Am. Chem. Soc. 137, 10914–10917 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	TSHBC	no	12.8
Cao, J. et al., J. Am. Chem. Soc. 137, 10914–10917 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	TSHBC	graphene	14
Casaluci, S. et al., J. Power Sources 297, 504–510 (2015)	2015	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	12.7
Casaluci, S. et al., J. Power Sources 297, 504–510 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	10
Casaluci, S. et al., J. Power Sources 297, 504–510 (2015)	2015	TiO2	0	MAPbI3	two-step	vasp	no	DMSO	spiro-OMeTAD	Li+TBP	11
Chang, C. Y. et al., ACS Appl. Mater. Interfaces 7, 4955–4961 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.6
Chang, C. Y. et al., ACS Appl. Mater. Interfaces 7, 4955–4961 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF+PEG	spiro-OMeTAD	Li+TBP	13.2

Chen, H. et al., Nano Energy 15, 216–226 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	10.4
Chen, H. et al., Nano Energy 15, 216–226 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	electrode position-dip	no	na	no	no	10.2
Chen, B. et al., Nano Energy 13, 582–591 (2015)	2015	TiO2	0	MAPbI3	two-step	spin	no	DMF	no	no	0.3
Chen, B. et al., Nano Energy 13, 582–591 (2015)	2015	TiO2	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	13.5
Chen, B. et al., Nano Energy 13, 582–591 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	13
Cheng, Y. et al., ACS Appl. Mater. Interfaces 7, 19986–19993 (2015)	2015	ZnO	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	2.9
Cheng, Y. et al., ACS Appl. Mater. Interfaces 7, 19986–19993 (2015)	2015	ZnO	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	5.4
Cheng, Y. et al., ACS Appl. Mater. Interfaces 7, 19986–19993 (2015)	2015	ZnO	PEI	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.2
Cheng, Y. et al., ACS Appl. Mater. Interfaces 7, 19986–19993 (2015)	2015	ZnO	PCBM	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.4

Cheng, M. et al.,Chem. Mater. 27, 1808–1814 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	POZ2	no	12.8
Cheng, M. et al., Chem. Mater. 27, 1808–1814 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	POZ3	no	11.5
Cheng, M. et al., Chem. Mater. 27, 1808–1814 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.8
Dao, V. D. et al., Thin Solid Films 593, 10–16 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	2.3
Dao, V. D. et al., Thin Solid Films 593, 10–16 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	5.2
Das, S. et al., ACS Photonics 2, 680–686 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13
Das, S. et al., ACS Photonics 2, 680–686 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spray	no	DMF	spiro-OMeTAD	Li+TBP	13
Dong, Q. et al., J. Phys. Chem. C 119, 10212–10217 (2015)	2015	SnO2	mTiO2	MAPbI3	two-step	spin-dip	no	na	spiro-OMeTAD	Li+TBP	7.3
Dong, Q. et al., J. Phys. Chem. C 119, 10212–10217 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	na	spiro-OMeTAD	Li+TBP	13.9
Du, T. et al., ACS Appl. Mater. Interfaces 7, 3382–3388 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	5.8
Du, T. et al., ACS Appl. Mater. Interfaces 7, 3382–3388 (2015)	2015	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	8.1

Fakharuddin, A. et al., J. Power Sources 283, 61–67 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.1
Fakharuddin, A. et al., J. Power Sources 283, 61–67 (2015)	2015	TiO2	TiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.2
Fakharuddin, A. et al., ACS Nano 9, 8420–8429 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	5.8
Fakharuddin, A. et al., ACS Nano 9, 8420–8429 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	7.9
Fakharuddin, A. et al., ACS Nano 9, 8420–8429 (2015)	2015	0	TiO2	MAPbI3-xClx	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	10.5
Gamliel, S. et al., J. Phys. Chem. C 119, 19722–19728 (2015)	2015	TiO2	0	MAPbI3	one-step	spray	no	DMF	no	no	6.9
Della Gaspera, E. et al., Nano Energy 13, 249–257 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.6
Della Gaspera, E. et al., Nano Energy 13, 249–257 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	1.2
Di Giacomo, F. et al., Adv. Energy Mater. 5, 1401808 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7
Di Giacomo, F. et al., Adv. Energy Mater. 5, 1401808 (2015)	2015	0	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	2.2
Di Giacomo, F. et al., Adv. Energy Mater. 5, 1401808 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.9

Gu, Z. et al., Sol. Energy Mater. Sol. Cells 140, 396–404 (2015)	2015	0	CdS-nanorod	MAPbI3	one-step	spin	no	GBL	no	no	8.36
Gu, Z. et al., Sol. Energy Mater. Sol. Cells 140, 396–404 (2015)	2015	0	CdS-nanorod	MAPbI3	one-step	spin	no	GBL	P3HT	no	1
Gu, Z. et al., Sol. Energy Mater. Sol. Cells 140, 396–404 (2015)	2015	0	CdS-nanorod	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	8.4
Guarnera, S. et al., J. Phys. Chem. Lett. 6, 432–437 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	H-TFSI+Et4N-TFSI	10.3
Guarnera, S. et al., J. Phys. Chem. Lett. 6, 432–437 (2015)	2015	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	H-TFSI+Et4N-TFSI+Al2O3	13.1
Han, G. S. et al., ACS Appl. Mater. Interfaces 7, 23521–23526 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.4
Han, G. S. et al., ACS Appl. Mater. Interfaces 7, 23521–23526 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.5
Han, G. S. et al., J. Mater. Chem. A 3, 9160–9164 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.7
Han, G. S. et al., J. Mater. Chem. A 3, 9160–9164 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.4

Hao, F. et al., J. Am. Chem. Soc. 137, 11445–11452 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	5.8
Hao, F. et al., J. Am. Chem. Soc. 137, 11445–11452 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMSO+SnF2	no	no	3.2
Heo, J. H. et al., Nano Energy 15, 530–539 (2015)	2015	TiO2	0	MAPbI3	one-step	spin 2-3	no	GBL	PTAA	Li+TBP	5.7
Heo, J. H. et al., Nano Energy 15,530–539 (2015)	2015	TiO2	0	MAPbI3	one-step	spin 2-3	no	GBL	PTAA	Li+TBP	5
Heo, J. H. et al., Nano Energy 15, 530–539 (2015)	2015	TiO2	mAl2O3	MAPbI3	one-step	spin 2-3	no	GBL	PTAA	Li+TBP	3.2
Heo, J. H. et al., Nano Energy 15, 530–539 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	PTAA	Li+TBP	15.7
Heo, J. H. et al., Nano Energy 15, 530–539 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	PTAA	Li+TBP	17.2
Hong, S. et al., Curr. Appl. Phys. 15, 574–579 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.8
Hou, Y. et al., Adv. Energy Mater. 5, 1500543 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	PEDOT	no	14.2
Hou, Y. et al., Adv. Energy Mater. 5, 1500543 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.4
Hou, Y. et al., Adv. Energy Mater. 5, 1500543 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	PEDOT	no	11.2

Huang, W. et al., Adv. Funct. Mater. 25, 5529–5536 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.3
Huang, W. et al., Adv. Funct. Mater. 25, 5529–5536 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12
Huang, L. et al., Sol. Energy Mater. Sol. Cells 141, 377–382 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.6
Huang, L. et al., Sol. Energy Mater. Sol. Cells 141, 377–382 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.7
Huangfu, M. et al., Appl. Surf. Sci. 357, 2234–2240 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	CuI	no	5.8
Hwang, K. et al., Adv. Mater. 27, 1241–1247 (2015)	2015	ZnO	0	MAPbI3	two-step	slot-die	no	DMF	P3HT	Li+TBP	12
Hwang, I. et al., ACS Appl. Mater. Interfaces 7, 17330–17336 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.8
Hwang, I. et al., ACS Appl. Mater. Interfaces 7, 17330–17336 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.3
Ito, S. et al., J. Phys. Chem. Lett. 6, 881–886 (2015)	2015	TiO2	0	MAPbI3	two-step	spin	no	DMF+DMSO	CuSCN	no	7.2
Ito, S. et al., J. Phys. Chem. Lett. 6, 881–886 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+DMSO	CuSCN	no	12

Ito, S. et al., J. Phys. Chem. Lett. 6, 881–886 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF+DMSO	CuSCN	no	0.1
Ito, S. et al., J. Phys. Chem. Lett. 6, 881–886 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF+DMSO	CuSCN	no	9.9
Jeon, N. J. et al., Nature 517, 476–480 (2015)	2015	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	toluene	DMSO+GBL	PTAA	Li+TBP	19
Jeong, I. et al., Nano Energy 17, 131–139 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.1
Jiang, C. et al., ACS Appl. Mater. Interfaces 7, 24726–24732 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.8
Jiang, C. et al., ACS Appl. Mater. Interfaces 7, 24726–24732 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15.6
Jin, Y. and Chumanov, G., ACS Appl. Mater. Interfaces 7, 12015–12021 (2015)	2015	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	no	no	10.2
Kang, M. S. et al., ACS Appl. Mater. Interfaces 7, 22213–22217 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	SGT-411	Li+TBP+FK 209	13
Kang, M. S. et al., ACS Appl. Mater. Interfaces 7, 22213–22217 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	SGT-41no	Li+TBP+FK 209	12.6

Kang, M. S. et al., ACS Appl. Mater. Interfaces 7, 22213–22217 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	SGT-4no9	Li+TBP+FK209	11
Kang, M. S. et al., ACS Appl. Mater. Interfaces 7, 22213–22217 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK209	13.8
Ke, W. et al., J. Am. Chem. Soc. 137, 6730–6733 (2015)	2015	SnO2	0	MAPbI3	two-step	spin 2-3-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK102	17.2
Ke, W. et al., J. Am. Chem. Soc. 137, 6730–6733 (2015)	2015	TiO2	0	MAPbI3	two-step	spin 2-3-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK102	15.2
Kim, G. Y. et al., J. Phys. Chem. Lett. 6, 2355–2362 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	10.6
Kim, G. Y. et al., J. Phys. Chem. Lett. 6,2355–2362 (2015)	2015	TiO2	mTiO2	MAPbI3-xBrx	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	13.6
Lee, J. W. et al., Adv. Energy Mater. 5, 1501310 (2015)	2015	TiO2	0	FAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.4
Lee, J. W. et al., Adv. Energy Mater. 5, 1501310 (2015)	2015	TiO2	0	FA0.9Cs0.1PbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	19
Li, F. et al., Mater. Lett. 157, 38–41 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.2
Li, F. et al., Mater. Lett. 157, 38–41 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-spray	no	DMF	spiro-OMeTAD	Li+TBP	12.5

Li, W. et al., J. Am. Chem. Soc. 137, 10399–10405 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.6
Li, W. et al., J. Am. Chem. Soc. 137, 10399–10405 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.2
Li, Y. et al., J. Phys. Chem. Lett. 6, 493–499 (2015)	2015	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	14.8
Li, Y. et al., J. Phys. Chem. Lett. 6, 493–499 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	12.1
Li, Y. et al., J. Phys. Chem. Lett. 6, 493–499 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	16.8
Li, Y. et al., J. Phys. Chem. Lett. 6, 493–499 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	3.4
Li, Y. et al., RSC Adv. 5, 28424–28429 (2015)	2015	SnO2	mSnO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.8
Li, Y. et al., J. Am. Chem. Soc. 137, 15540–15547 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.4
Li, Y. et al., J. Am. Chem. Soc. 137, 15540–15547 (2015)	2015	TiO2	PCBB-2CN-2C8	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	17.4
Li, C. et al., ACS Appl. Mater. Interfaces 7, 15117–15122 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	10.7
Li, C. et al., ACS Appl. Mater. Interfaces 7, 15117–	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	10.7

15122 (2015)											
Listorti, A. et al., J. Phys. Chem. Lett. 6, 1628–1637 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.3
Listorti, A. et al., J. Phys. Chem. Lett. 6, 1628–1637 (2015)	2015	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.8
Listorti, A. et al., J.Phys. Chem. Lett. 6, 1628–1637 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.7
Liu, D. et al., ACS Appl. Mater. Interfaces 7, 16330–16337 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin-TSA	no	DMF	spiro-OMeTAD	Li+TBP	14.1
Liu, D. et al., ACS Appl. Mater. Interfaces 7, 16330–16337 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin-OTA	no	DMF	spiro-OMeTAD	Li+TBP	9
Liu, D. et al., ACS Appl. Mater. Interfaces 7, 16330–16337 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin-OSA	no	DMF	spiro-OMeTAD	Li+TBP	10.2
Liu, J. et al., J. Phys. Chem. Lett. 6, 1666–1673 (2015)	2015	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	no	no	6.5
Liu, J. et al., J. Phys. Chem. Lett. 6, 1666–1673 (2015)	2015	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	PEDOT	no	14.5
Liu, J. et al., J. Phys. Chem. Lett. 6, 1666–1673 (2015)	2015	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.6

Liu, C. et al., ACS Appl. Mater. Interfaces 7, 1153–1159 (2015)	2015	TiO2	0	MAPbI3	two-step	spin	no	DMF	P3HT	no	7.1
Liu, C. et al., ACS Appl. Mater. Interfaces 7, 1153–1159 (2015)	2015	TiO2	PCBM	MAPbI3	two-step	spin	no	DMF	P3HT	no	14.6
Liu, C. et al., ACS Appl. Mater. Interfaces 7, 1153–1159 (2015)	2015	TiO2	PCBM	MAPbI3	two-step	spin	no	DMF	P3HT	no	13.2
Liu, C. et al., ACS Appl. Mater. Interfaces 7, 9066–9071 (2015)	2015	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	10.2
Liu, C. et al., ACS Appl. Mater. Interfaces 7, 9066–9071 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	7.7
Liu, J. et al., J. Mater. Chem. A 3, 11750–11755 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	12.8
Liu, J. et al., J. Mater. Chem. A 3, 11750–11755 (2015)	2015	CdS	0	MAPbI3	one-step	spin	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	11.2
Liu, J. et al., J. Mater. Chem. A 3, 11750–11755 (2015)	2015	ZnS	0	MAPbI3	one-step	spin	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	1
Liu, J. et al., J. Mater. Chem. A 3, 11750–11755 (2015)	2015	no	no	MAPbI3	one-step	spin	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	3.6
Liu, Z. et al., Dalt. Trans. 44, 3967–3973 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	mNiO	no	11.4

Liu, Z. et al., Dalt. Trans. 44, 3967–3973 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	ZrO2	no	8.2
Luo, Q. et al., J. Mater. Chem. A 3, 15996–16004 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	RGO-1	no	9.3
Luo, Q. et al., J. Mater. Chem. A 3, 15996–16004 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	RGO-2	no	8.3
Luo, Q. et al., J. Mater. Chem. A 3, 15996–16004 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	RGO-3	no	7
Luo, Q. et al., J. Mater. Chem. A 3, 15996–16004 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	GO	no	5.5
Luo, Q. et al., J. Mater. Chem. A 3, 15996–16004 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	no	5.9
Luo, Q. et al., J. Mater. Chem. A 3, 15996–16004 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.3
Luo, P. et al., ACS Appl. Mater. Interfaces 7, 2708–2714 (2015)	2015	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	3.6
Luo, P. et al., ACS Appl. Mater. Interfaces 7, 2708–2714 (2015)	2015	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	10.5
Luo, P. et al., ACS Appl. Mater. Interfaces 7, 2708–2714 (2015)	2015	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	12.7

Lv, M. et al., ACS Appl. Mater. Interfaces 7, 17482–17488 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	no	no	5.7
Lv, M. et al., ACS Appl. Mater. Interfaces 7, 17482–17488 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	CuInS2/ZnS	no	8.4
Lv, M. et al., ACS Appl. Mater. Interfaces 7, 17482–17488 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	CuInS2	no	6.6
Lv, M. et al., ACS Appl. Mater. Interfaces 7, 17482–17488 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.9
Ma, Y. et al., ACS Appl. Mater. Interfaces 7, 6406–6411 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	spin-dip	no	DMF	no	no	3.4
Ma, Y. et al., ACS Appl. Mater. Interfaces 7, 6406–6411 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	spin-dip	no	DMF	TPD	no	7.1
Ma, Y. et al., ACS Appl. Mater. Interfaces 7, 6406–6411 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	spin-dip	no	DMF	TPD	no	3.2
Mahmood, K. et al., Adv. Energy Mater. 5, 1500568 (2015)	2015	ZnO	N-ZnO-nanorod	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.2
Mahmood, K. et al., Adv. Energy Mater. 5, 1500568 (2015)	2015	ZnO	ZnO-nanorod	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.5
Mali, S. S. et al., Chem. Mater. 27, 1541–1551 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	10

Mali, S. S. et al., Chem. Mater. 27, 1541–1551 (2015)	2015	TiO2	TiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	13.8
Mali, S. S. et al., Chem. Mater. 27, 1541–1551 (2015)	2015	TiO2	TiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	10
Matteocci, F. et al., ACS Appl. Mater. Interfaces 7, 26176–26183 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.4
Matteocci, F. et al., ACS Appl. Mater. Interfaces 7, 26176–26183 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	blade-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.9
Matteocci, F. et al., ACS Appl. Mater. Interfaces 7, 26176–26183 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.3
Matteocci, F. et al., ACS Appl. Mater. Interfaces 7, 26176–26183 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	9.7
Nejand, B. A. et al., ACS Appl. Mater. Interfaces 7, 21807–21818 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	NiOx	no	1.3
Nejand, B. A. et al., ACS Appl. Mater. Interfaces 7, 21807–21818 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.2
Peng, Y. et al., J. Mater. Chem. A 3, 12436–12442 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	14.1
Raga, S. R. et al., Chem. Mater. 27, 1597–1603 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.5

Raga, S. R. et al.,Chem. Mater. 27, 1597–1603 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9
Raga, S. R. et al., Chem. Mater. 27, 1597–1603 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.7
Raga, S. R. et al., Chem. Mater. 27, 1597–1603 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.1
Raga, S. R. et al., Chem. Mater. 27, 1597–1603 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.3
Rakstys, K. et al., J. Am. Chem. Soc. 137, 16172–16178 (2015)	2015	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)	one-step	spin 2-3	chlorobenzene	DMF+DMSO	KR131	Li+TBP+FK209	18.3
Rakstys, K. et al., J. Am. Chem. Soc. 137, 16172–16178 (2015)	2015	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)	one-step	spin 2-3	chlorobenzene	DMF+DMSO	KR133	Li+TBP+FK209	16.8
Rakstys, K. et al., J. Am. Chem. Soc. 137, 16172–16178 (2015)	2015	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)	one-step	spin 2-3	chlorobenzene	DMF+DMSO	KR145	Li+TBP+FK209	11.9
Rakstys, K. et al., J. Am. Chem. Soc. 137, 16172–16178 (2015)	2015	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)	one-step	spin 2-3	chlorobenzene	DMF+DMSO	KR122	Li+TBP+FK209	9
Rakstys, K. et al., J. Am. Chem. Soc. 137, 16172–16178 (2015)	2015	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	17.9
Razza, S. et al., J. Power Sources 277, 286–291 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	blade-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.3
Razza, S. et al., J. Power Sources 277, 286–291 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13

Sabba, D. et al., J. Phys. Chem. C 119, 1763–1767 (2015)	2015	TiO2	mTiO2	CsSnI2.9Br0.1	one-step	spin	no	DMSO+SnF2	spiro-OMeTAD	Li+TBP	1.8
Sabba, D. et al., J. Phys. Chem. C 119, 1763–1767 (2015)	2015	TiO2	mTiO2	CsSnI3	one-step	spin	no	DMSO+SnF2	spiro-OMeTAD	Li+TBP	1.7
Sabba, D. et al., J. Phys. Chem. C 119, 1763–1767 (2015)	2015	TiO2	mTiO2	CsSnBr3	one-step	spin	no	DMSO+SnF2	spiro-OMeTAD	Li+TBP	1
Seol, D. J. et al., ChemSusChem 8, 2414–2419 (2015)	2015	TiO2	0	FAPbI3	two-step	spin 2-3-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.2
Sepalage, G. A. et al., Adv. Funct. Mater. 25, 5650–5661 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	DMF	CuI	no	7.5
Sepalage, G. A. et al., Adv. Funct. Mater. 25, 5650–5661 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	DMF	CuI	no	1.1
Sepalage, G. A. et al., Adv. Funct. Mater. 25, 5650–5661 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.8
Sepalage, G. A. et al., Adv. Funct. Mater. 25, 5650–5661 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.1
Sfyri, G. et al., Sol. Energy Mater. Sol. Cells 134, 60–63 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	no	2.8
Shen, P. S. et al., Sol. Energy 120, 345–356 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	11.8

Shi, Y. et al., J. Phys. Chem. C 119, 15868–15873 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	12.7
Shi, Y. et al., J. Phys. Chem. C 119, 15868–15873 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	7.9
Shi, Y. et al., J. Phys. Chem. C 119, 15868–15873 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	6.8
Shi, Y. et al., J. Phys. Chem. C 119, 15868–15873 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14.1
Son, D. Y. et al., J. Phys. Chem. C 119, 10321–10328 (2015)	2015	0	ZnO-nanorod	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.4
Son, D. Y. et al., J. Phys. Chem. C 119, 10321–10328 (2015)	2015	0	ZnO-nanorod	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.7
Song, D. et al., J. Phys. Chem. C 119, 22812–22819 (2015)	2015	TiO2	0	MAPbI3	two-step	spin 2-3-dip	no	DMSO	spiro-OMeTAD	Li+TBP	16.4
Song, D. et al., J. Phys. Chem. C 119, 22812–22819 (2015)	2015	TiO2	0	MAPbI3	two-step	spin 2-3-dip	no	DMSO	spiro-OMeTAD	Li+TBP	17.5
Song, D. et al., J. Phys. Chem. C 119, 22812–22819 (2015)	2015	TiO2	0	MAPbI3	two-step	spin 2-3-dip	no	DMSO	spiro-OMeTAD	Li+TBP	16
Song, D. et al., J. Phys. Chem. C 119, 22812–22819 (2015)	2015	TiO2	0	MAPbI3	two-step	spin 2-3-dip	no	DMSO	spiro-OMeTAD	Li+TBP	15.4
Song, D. et al., J. Phys. Chem. C 119, 22812–22819 (2015)	2015	TiO2	0	MAPbI3	two-step	spin 2-3-dip	no	DMSO	spiro-OMeTAD	Li+TBP	6

Song, T. B. et al., Nano Energy 12, 494–500 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.9
Song, T. B. et al., Nano Energy 12, 494–500 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.9
Song, T. B. et al., Nano Energy 12, 494–500 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.1
Song, T. B. et al.,Nano Energy 12, 494–500 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14
Song, T. B. et al., Nano Energy 12, 494–500 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13
Sun, H. et al, Solid State Sci. 40, 60–66 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	GBL	no	no	3.5
Sun, H. et al, Solid State Sci. 40, 60–66 (2015)	2015	TiO2	TiO2	MAPbI3	one-step	spin	no	GBL	no	no	4.3
Sun, C. et al., Sol. Energy Mater. Sol. Cells 143, 360–368 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.9
Sung, S. et al., Nanoscale 7, 8898–8906 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	17.2
Tao, H. et al., J. Power Sources 290, 144–152 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.6
Tao, H. et al., J. Power Sources 290, 144–152 (2015)	2015	0	TiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.8

Tripathi, B. et al.,Sol. Energy Mater. Sol. Cells 132, 615–622 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	1.1
Tripathi, B. et al.,Sol. Energy Mater. Sol. Cells 132, 615–622 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	0.9
Tripathi, B. et al.,Sol. Energy Mater. Sol. Cells 132, 615–622 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	0.3
Wang, Z. et al., Chem. Mater. 27, 7149–7155 (2015)	2015	TiO2	mTiO2	FAPbI3 + FACl	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.7
Wang, Z. et al., Chem. Mater. 27, 7149–7155 (2015)	2015	TiO2	mTiO2	FAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	0.2
Wang, Z. et al., Chem. Mater. 27, 7149–7155 (2015)	2015	TiO2	mTiO2	FAPbI3	one-step	spin	no	DMF+MACl	spiro-OMeTAD	Li+TBP	7
Wang, Z. et al., Chem. Mater. 27, 7149–7155 (2015)	2015	TiO2	mTiO2	FAPbI3	one-step	spin	no	DMF+NH4Cl	spiro-OMeTAD	Li+TBP	0.6
Wang, M. et al., Chem. Phys. Lett. 639, 283–288 (2015)	2015	ZnO	ZnO-nanorod	MAPbI3	two-step	spin-dip	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	6.6
Wang, M. et al., Chem. Phys. Lett. 639, 283–288 (2015)	2015	ZnO	ZnO-nanorod	MAPbI3	two-step	spin-dip	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	4.3
Wang, J. Y. et al.,ACS Appl. Mater. Interfaces 7, 27676–27684 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	10.7

Wang, J. Y. et al., ACS Appl. Mater. Interfaces 7, 27676–27684 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	8.7
Wang, H. et al., ACS Photonics 2, 849–855 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	Rno1	Li+TBP	7.5
Wang, H. et al., ACS Photonics 2, 849–855 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.7
Wang, H. et al., ACS Photonics 2, 849–855 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	Rno1	Li+TBP+MY11	12
Wang, H. et al., ACS Photonics 2, 849–855 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+MY11	12.2
Wang, F. et al., Adv. Funct. Mater. 25, 1120–1126 (2015)	2015	TiO2	0	FAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.1
Wang, F. et al., Adv. Funct. Mater. 25, 1120–1126 (2015)	2015	TiO2	0	FAPbI3	one-step	spin	no	DMF+HCl	spiro-OMeTAD	Li+TBP	17.5
Wang, F. et al., Adv. Funct. Mater. 25, 1120–1126 (2015)	2015	TiO2	0	FAPbI3	one-step	spin	no	DMF+HI	spiro-OMeTAD	Li+TBP	12.4
Wang, K. et al., J. Phys. Chem. Lett. 6, 755–759 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.6
Wang, K. et al., J. Phys. Chem. Lett. 6, 755–759 (2015)	2015	WOx	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.4
Wei, H. et al., Carbon 93, 861–868 (2015)	2015	TiO2	0	MAPbI3	two-step	spin 2-3-dip	no	DMF	no	no	13.5

Wei, H. et al., Carbon 93, 861–868 (2015)	2015	TiO2	0	MAPbI3	two-step	spin 2-3-dip	no	DMF	no	no	10.7
Werner, J. et al., Sol. Energy Mater. Sol. Cells 141, 407–413 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	12.2
Werner, J. et al., Sol. Energy Mater. Sol. Cells 141, 407–413 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	10.4
Wojciechowski, K. et al., J. Phys. Chem. Lett. 6, 2399–2405 (2015)	2015	C60	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.5
Wojciechowski, K. et al., J. Phys. Chem. Lett. 6, 2399–2405 (2015)	2015	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.9
Wojciechowski, K. et al., J. Phys. Chem. Lett. 6, 2399–2405 (2015)	2015	C60	0	MAPbI3-xClx	two-step	evap-spin	no	DMF	spiro-OMeTAD	Li+TBP	14.5
Wojciechowski, K. et al., J. Phys. Chem. Lett. 6, 2399–2405 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	evap-spin	no	DMF	spiro-OMeTAD	Li+TBP	13.6
Wozny, S. et al., Chem. Mater. 27, 4814–4820 (2015)	2015	TiO2	0	FAPbI3	one-step	spin 2-3	toluene	DMF	spiro-OMeTAD	Li+TBP	13.5
Wozny, S. et al., Chem. Mater. 27, 4814–4820 (2015)	2015	TiO2	0	FAPbI3	one-step	spin 2-3	toluene	DMF	spiro-OMeTAD	Li+TBP	13
Wozny, S. et al., Chem. Mater. 27, 4814–4820 (2015)	2015	TiO2	0	FAPbI3	one-step	spin 2-3	toluene	DMF	spiro-OMeTAD	Li+TBP	10.3

Wozny, S. et al., Chem. Mater. 27, 4814–4820 (2015)	2015	TiO2	0	FAPbI3	one-step	spin 2-3	toluene	DMF	spiro-OMeTAD	Li+TBP	16.6
Wu, Y. et al., ACS Appl. Mater. Interfaces 7, 20707–20713 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO	spiro-OMeTAD	Li+TBP+FK102	16
Wu, N. et al., Appl. Surf. Sci. 357, 2372–2377 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	11.1
Xia, X. et al., ACS Appl. Mater. Interfaces 7, 16907–16912 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-spray	no	DMF	spiro-OMeTAD	Li+TBP	16.2
Xie, Y. et al., ACS Appl. Mater. Interfaces 7, 12937–12942 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.4
Xie, Y. et al., ACS Appl. Mater. Interfaces 7, 12937–12942 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.1
Xu, X. et al., Nano Lett. 15, 6514–6520 (2015)	2015	TiO2	0	Cl-FAPbI3	two-step	spin	no	na	spiro-OMeTAD	Li+TBP	15.3
Xu, X. et al., Nano Lett. 15, 6514–6520 (2015)	2015	no	no	Cl-FAPbI3	two-step	spin	no	na	spiro-OMeTAD	Li+TBP	15.5
Yang, Z. et al., Nano Energy 15, 670–678 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-contact	no	DMF	spiro-OMeTAD	Li+TBP	16
Yang, Y. and Wang, W., J. Power Sources 293, 577–584 (2015)	2015	0	mTiO2	MAPbI3	one-step	spin	no	DMF	P3HT	Li+TBP	4.9

Yang, Y. and Wang, W., J. Power Sources 293, 577– 584 (2015)	2015	0	mTiO2	MAPbI3	one-step	spin	no	DMF	P3HT	Li+TBP	1.9
Yang, D. et al.,Energy Environ. Sci. 8, 3208– 3214 (2015)	2015	TiO2	0	MAPbI3-xClx	two-step	CVD	no	na	spiro-OMeTAD	Li+TBP	16.2
Yang, W. S. et al., Science 348, 1234– 1237 (2015)	2015	TiO2	mTiO2	FAPbI3	two-step	spin	no	DMF	PTAA	Li+TBP	15.6
Yang, W. S. et al., Science 348, 1234– 1237 (2015)	2015	TiO2	mTiO2	FAPbI3	two-step	spin	no	DMF+DMSO	PTAA	Li+TBP	20.1
Yang, L. et al., ACS Appl. Mater. Interfaces 7, 14614– 14619 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.4
Yang, L. et al., ACS Appl. Mater. Interfaces 7, 14614– 14619 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF+HCl	spiro-OMeTAD	Li+TBP	15.2
Yang, L. et al., ACS Appl. Mater. Interfaces 7, 14614– 14619 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF+HI	spiro-OMeTAD	Li+TBP	12.2
You, P. et al., Adv. Mater. 27, 3632– 3638 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.6
You, P. et al., Adv. Mater. 27, 3632– 3638 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.4
Yu, J. C. et al., Adv. Mater. 27, 3492– 3500 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.3

Yu, J. C. et al., Adv. Mater. 27, 3492–3500 (2015)	2015	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.8
Yue, Y. et al., J. Phys. Chem. C 119, 22847–22854 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	13.1
Yue, Y. et al., J. Phys. Chem. C 119, 22847–22854 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	5.3
Yue, Y. et al., J. Phys. Chem. C 119, 22847–22854 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	14
Yue, Y. et al., J. Phys. Chem. C 119, 22847–22854 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	8
Zhang, T. et al., Nano Lett. 15, 3959–3963 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	17.2
Zhang, T. et al., Nano Lett. 15, 3959–3963 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	6.4
Zhang, J. and Pauporté, T., J. Phys. Chem. C 119,14919–14928 (2015)	2015	TiO2	0	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	6.7
Zhang, J. and Pauporté, T., J. Phys. Chem. C 119, 14919–14928 (2015)	2015	ZnO	0	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	15
Zhang, J. and Pauporté, T., J. Phys. Chem. C 119, 14919–14928 (2015)	2015	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	9.4
Zhang, J. and Pauporté, T., J. Phys. Chem. C 119, 14919–14928 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	3.8

Zhang, J. and Pauporté, T., J. Phys. Chem. C 119, 14919–14928 (2015)	2015	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.9
Zhang, J. and Pauporté, T., J. Phys. Chem. C 119, 14919–14928 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	6.3
Zhang, H. et al., J. Energy Chem. 24, 729–735 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	16.1
Zhang, M. et al., Chem. Commun. 51, 10038–10041 (2015)	2015	TiO2	0	MAPbBr3	one-step	blowdry	no	DMF	P3HT	no	10.2
Zhang, M. et al., Chem. Commun. 51, 10038–10041 (2015)	2015	TiO2	0	MAPbBr3	one-step	spin	no	DMF	P3HT	no	4.8
Zhang, Z. et al., Sol. Energy 122, 97–103 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+IPA	spiro-OMeTAD	Li+TBP	12.2
Zhang, Z. et al., Sol. Energy 122, 97–103 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF+IPA	spiro-OMeTAD	Li+TBP	12.5
Zhang, Y. et al., J. Power Sources 274, 1224–1230 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	no	no	3.5
Zhang, Y. et al., J. Power Sources 274, 1224–1230 (2015)	2015	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	6.1
Zheng, X. et al., Nano Energy 17, 269–278 (2015)	2015	TiO2	mTiO2	MAPbBr3	one-step	spin 2-3	toluene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	8.3
Zheng, Y. C. et al., Chem. Mater. 27, 5116–5121 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.1

Zheng, Y. C. et al., Chem. Mater. 27, 5116–5121 (2015)	2015	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	1.6
Zhong, D. et al., Nano Energy 11, 409–418 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11
Zhong, D. et al.,Nano Energy 11, 409–418 (2015)	2015	TiO2	TiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.9
Zhong, D. et al., Nano Energy 11, 409–418 (2015)	2015	TiO2	TiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.1
Zhou, Y. et al., J. Phys. Chem. Lett. 6, 2292–2297 (2015)	2015	TiO2	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.1
Zhou, Y. et al., J. Phys. Chem. Lett. 6, 2292–2297 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.8
Zhou, H. et al., J. Phys. Chem. C 119, 4600–4605 (2015)	2015	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	no	no	8.7
Zhu, L. et al., Nano Energy 15, 540–548 (2015)	2015	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	no	14
Zhu, L. et al., Nano Energy 15, 540–548 (2015)	2015	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	no	17.4
Zuo, L. et al., J. Am. Chem. Soc. 137, 2674–2679 (2015)	2015	ZnO	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li	12
Zuo, L. et al., J. Am. Chem. Soc. 137, 2674–2679 (2015)	2015	ZnO	C3-SAM	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li	15.7

Adhikari, N. et al., Nanoscale 8, 2693–2703 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.3
Adhikari, N. et al., Nanoscale 8, 2693–2703 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.4
Bae, S. et al., J. Phys. Chem. Lett. 7, 3091–3096 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	14.3
Bai, S. et al., Electrochim. Acta 190, 775–779 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	no	no	12.5
Bai, S. et al., Electrochim. Acta 190, 775–779 (2016)	2016	TiO2	mTiO2	FAPbI3	two-step	spin	no	DMF	no	no	7.4
Bai, S. et al., Electrochim. Acta 190, 775–779 (2016)	2016	TiO2	mTiO2	FAxMA1-xPbI3	two-step	spin	no	DMF	no	no	13
Bai, Y. et al., ChemSusChem 9, 2686–2691 (2016)	2016	SnO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	17.7
Bai, Y. et al., ChemSusChem 9, 2686–2691 (2016)	2016	SnO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	15.7
Behrouznejad, F. et al., J. Mater. Chem. A 4, 13488–13498 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	no	no	3.1
Behrouznejad, F. et al., J. Mater. Chem. A 4, 13488–13498 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	no	no	2.6
Behrouznejad, F. et al., J. Mater. Chem. A 4, 13488–13498	2016	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	no	no	0.2

(2016)											
Behrouznejad, F. et al., J. Mater. Chem. A 4, 13488–13498 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	16.5
Behrouznejad, F. et al., J. Mater. Chem. A 4, 13488–13498 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	16.4
Behrouznejad, F. et al., J. Mater. Chem. A 4, 13488–13498 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	14.7
Besleaga, C. et al., J. Phys. Chem. Lett. 7, 5168–5175 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	diethyl ether	DMF+DMSO	no	no	5.9
Besleaga, C. et al., J. Phys. Chem. Lett. 7, 5168–5175 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	12
Besleaga, C. et al., J. Phys. Chem. Lett. 7, 5168–5175 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	11.6
Bi, D. et al., Sci. Adv. 2, e1501170–e1501170 (2016)	2016	TiO2	mTiO2	FAI, PbI2, MABr, and PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	20.8
Chang, S. et al., ACS Appl. Mater. Interfaces 8, 8511–8519 (2016)	2016	IBF-Ep	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.9
Chang, S. et al., ACS Appl. Mater. Interfaces 8, 8511–8519 (2016)	2016	PCBM	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	2.5

Chaudhary, D. K. et al., RSC Adv. 6, 94731–94738 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	8.1
Chaudhary, D. K. et al., RSC Adv. 6, 94731–94738 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	5.5
Chen, H. N. et al., Adv. Energy Mater. 6, 1502087 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	8.7
Chen, H. N. et al., Adv. Energy Mater. 6, 1502087 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF+cyclohexane	no	no	14.4
Chen, X. et al., J. Mater. Chem. A 4, 6521–6526 (2016)	2016	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.3
Chen, X. et al., J.Mater. Chem. A 4, 6521–6526 (2016)	2016	TiO2	TiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15.7
Chen, L.-C. et al., Mater. Sci. Semicond. Process. 56, 179–182 (2016)	2016	graphe ne	mTiO2	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	6.9
Chen, H. W. et al., Sci. Rep. 6, 34319 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	MEH-PPV	no	9.7
Chen, H. W. et al., Sci. Rep. 6, 34319 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.3
Chen, H. W. et al., Sci. Rep. 6, 34319 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.3
Chen, H. W. et al., Sci. Rep. 6, 34319 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.4

Chen, B.-X. et al., J. Mater. Chem. A 4, 15662–15669 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	toluene	DMSO	spiro-OMeTAD	Li+TBP	5.6
Chen, B.-X. et al., J. Mater. Chem. A 4, 15662–15669 (2016)	2016	TiO2	PS	MAPbI3	one-step	spin	toluene	DMSO	spiro-OMeTAD	Li+TBP	11.7
Cheng, N. et al., J. Power Sources 321, 71–75 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	no	no	12.7
Cheng, N. et al., J. Power Sources 321, 71–75 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	no	no	9.9
Cheng, N. et al., J. Power Sources 319, 111–115 (2016)	2016	TiO2	0	MAPbI3	two-step	spin	chlorobenzene	DMF	spiro-OMeTAD	no	11.6
Cheng, N. et al., J. Power Sources 319, 111–115 (2016)	2016	TiO2	0	MAPbI3	two-step	spin	ethanol	DMF	spiro-OMeTAD	no	12.1
Cheng, N. et al., J. Power Sources 319, 111–115 (2016)	2016	TiO2	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	no	10.3
Cheng, N. et al., J. Power Sources 319, 111–115 (2016)	2016	TiO2	0	MAPbI3	two-step	spin	IPA	DMF	spiro-OMeTAD	no	11.2
Chiang, Y.-H. et al., ChemSusChem 9, 2620–2627 (2016)	2016	TiO2	mTiO2	MAPb(SCN)xI3-x	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	12.7
Chiang, Y.-H. et al., ChemSusChem 9, 2620–2627 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	11.3
Cohen, B. El et al., J. Phys. Chem. C 120, 142–147 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	10.3

Cohen, B. El et al., J. Phys. Chem. C 120, 142–147 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	toluene	DMF	no	no	11.8
Cui, D. et al., J.Phys. Chem. C 120, 42–47 (2016)	2016	TiO2	0	MAPbBr3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	3.5
Cui, D. et al., J. Phys. Chem. C 120, 42–47 (2016)	2016	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	12.8
Cui, D. et al., J. Phys. Chem. C 120, 42–47 (2016)	2016	TiO2	0	MAPbI3-xBrx	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	6.8
Cui, D. et al., J. Phys. Chem. C 120, 42–47 (2016)	2016	TiO2	0	MAPbI3-xBrx	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	4.1
Du, Y. et al., RSC Adv. 6, 83264–83272 (2016)	2016	TiO2	0	MAPbI3	two-step	CVD	no	na	P3HT	Li+TBP	11.2
Du, Y. et al., RSC Adv. 6, 101250–101258 (2016)	2016	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.4
Du, Y. et al., RSC Adv. 6, 101250–101258 (2016)	2016	TiO2	0	MAPbI3	two-step	CVD	no	na	spiro-OMeTAD	Li+TBP	12.7
Duan, J. et al., Int. J. Energy Res. 40, 806–813 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	dipping	no	na	spiro-OMeTAD	Li+TBP	10.5
Duan, J. et al., Int. J. Energy Res. 40, 806–813 (2016)	2016	ZnO	mTiO2	MAPbI3	two-step	dipping	no	na	spiro-OMeTAD	Li+TBP	8
Duan, J. et al., Int. J. Energy Res. 40, 806–813 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	dipping	no	na	spiro-OMeTAD	Li+TBP	12.8

Dubey, A. et al, Sol. Energy Mater. Sol. Cells 145, 193–199 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	PDPP3T	no	12.3
Dubey, A. et al, Sol. Energy Mater. Sol. Cells 145, 193–199 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.3
Fei, C. et al., Nano Energy 27, 17–26 (2016)	2016	SnO2	0	MAPbI3	one-step	spin	ethylacetate	DMF	spiro-OMeTAD	Li+TBP	14
Fei, C. et al., Nano Energy 27, 17–26 (2016)	2016	SnO2	0	MAPbI3-xClx	one-step	spin	ethylacetate	DMF	spiro-OMeTAD	Li+TBP	17.2
Fernandes, S. L. et al., Mater. Lett. 181, 103–107 (2016)	2016	Nb2O5	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	no	12.3
Fu, K. et al., Nanoscale 8, 4181–4193 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	14.6
Gong, G. et al., J. Mater. Chem. A 4, 3661–3666 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	DEPT-SC	no	9.7
Gong, G. et al., J. Mater. Chem. A 4, 3661–3666 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	DOPT-SC	no	8.7
Gong, G. et al., J. Mater. Chem. A 4, 3661–3666 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	DHPT-SC	no	8.4
Gong, G. et al., J. Mater. Chem. A 4, 3661–3666 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	no	5.4
Gong, G. et al., Org. Electron. physics, Mater. Appl. 35, 171–	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	DEPT-SC	no	9.7

175 (2016)											
Gong, G. et al., Org. Electron. physics, Mater. Appl. 35, 171–175 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	DEPT-SC	Li+TBP	5.2
Gong, G. et al., Org. Electron. physics, Mater. Appl. 35, 171–175 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.2
Gong, G. et al., Org. Electron. physics, Mater. Appl. 35, 171–175 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	DEPT-SC	F4TCNQ	11.5
Guerrero, A. et al., J. Phys. Chem. C 120, 8023–8032 (2016)	2016	SnO2	0	FA0.85MA0.15Pb(I0.85Br0.15)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	16.9
Guerrero, A. et al., J. Phys. Chem. C 120, 8023–8032 (2016)	2016	TiO2	0	FA0.85MA0.15Pb(I0.85Br0.15)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	9.8
Guerrero, A. et al., J. Phys. Chem. C 120, 8023–8032 (2016)	2016	Nb2O5	0	FA0.85MA0.15Pb(I0.85Br0.15)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	0.1
Guo, J. J. et al., Synth. Met. 220, 462–468 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	CoPcNO2-Oph	no	8.2

Guo, J. J. et al., Synth. Met. 220, 462–468 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.8
Guo, Y. et al., RSC Adv. 6, 62522–62528 (2016)	2016	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.4
Hao, Q. et al., J. Alloys Compd. 671, 11–16 (2016)	2016	TiO2	0	MAPbI3	two-step	vasp	no	NEP	spiro-OMeTAD	Li+TBP	10.2
He, X. et al., J. Power Sources 332, 366–371 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF	spiro-OMeTAD	Li+TBP	17.6
He, X. et al., J. Power Sources 332, 366–371 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF	spiro-OMeTAD	Li+TBP	15.2
He, X. et al., J. Power Sources 332, 366–371 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF	spiro-OMeTAD	Li+TBP	13.5
Heo, J. H. and Im, S. H., Nanoscale 8, 2554–2560 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF+HI	PTAA	Li+TBP	18.9
Hou, Y. et al., Sol. Energy Mater. Sol. Cells 155, 101–107 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14
Hou, Y. et al., Sol. Energy Mater. Sol. Cells 155, 101–107 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.8
Hou, X. et al., Sol. Energy Mater. Sol. Cells 149, 121–127 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12

Hou, X. et al., Sol. Energy Mater. Sol. Cells 149, 121–127 (2016)	2016	TiO2	ZGO	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.3
Hu, Y. et al., J. Alloys Compd. 679, 32–38 (2016)	2016	TiO2	TiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.2
Hu, Y. et al., J. Alloys Compd. 679, 32–38 (2016)	2016	TiO2	TiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8
Huang, L. et al., Sol. Energy Mater. Sol. Cells 149, 1–8 (2016)	2016	TiO2	no	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.3
Huang, L. et al., Sol. Energy Mater. Sol. Cells 149, 1–8 (2016)	2016	no	no	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.7
Huang, F. et al., Nano Energy 27, 509–514 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.8
Huang, Y. et al., Thin Solid Films 598, 1–5 (2016)	2016	TiO2	TiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.3
Huang, J. et al., RSC Adv. 6, 55720–55725 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	TFSI+TBP	12.1
Huang, J. et al., RSC Adv. 6, 55720–55725 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	TFSI+TBP	12.7
Huang, J. et al., RSC Adv. 6, 55720–55725 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF+HBr	spiro-OMeTAD	TFSI+TBP	15.8
Huang, J. et al., RSC Adv. 6, 55720–55725 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF+HCl	spiro-OMeTAD	TFSI+TBP	13.7

Huang, J. et al., RSC Adv. 6, 55720–55725 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF+HI	spiro-OMeTAD	TFSI+TBP	14.4
Huang, J. et al., Sol. Energy 133, 331–338 (2016)	2016	ZnO	0	MAPbI3	two-step	CVD	no	na	spiro-OMeTAD	no	8.3
Huang, J. et al., Sol. Energy 133, 331–338 (2016)	2016	FPDI	0	MAPbI3	two-step	CVD	no	na	spiro-OMeTAD	no	7.9
Huang, H. et al., Nano Energy 27, 352–358 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spray	no	DMSO	spiro-OMeTAD	Li+TBP+FK 209	16
Jain, S. M. et al., Energy Environ. Sci. 9, 3770–3782 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	18.5
Jain, S. M. et al., Energy Environ. Sci. 9, 3770–3782 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	9.5
Jeon, S. et al., Org. Electron. physics, Mater. Appl. 37, 134–140 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	DPIO	no	10.1
Jeon, S. et al., Org. Electron. physics, Mater. Appl. 37, 134–140 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	DPIE	no	5.4
Jeon, S. et al., Org. Electron. physics, Mater. Appl. 37, 134–140 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	no	12
Jeon, S. et al., Org. Electron. physics, Mater. Appl. 37, 134–140 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	no	7.9

Jeong, I. et al., Nano Energy 28, 380–389 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.6
Jeong, I. et al., Nano Energy 28, 380–389 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.5
Jiang, X. et al., J. Phys. Chem. Lett. 7, 4142–4146 (2016)	2016	0	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	12.3
Jiang, X. et al., J. Phys. Chem. Lett. 7, 4142–4146 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	no	no	12.7
Jiang, X. et al., J. Phys. Chem. Lett. 7, 4142–4146 (2016)	2016	0	mTiO2	(5-AVA)x(MA)1-xPbI3	one-step	spin	no	GBL	no	no	12.9
Jiang, X. et al., J. Phys. Chem. Lett. 7, 4142–4146 (2016)	2016	TiO2	mTiO2	(5-AVA)x(MA)1-xPbI3	one-step	spin	no	GBL	no	no	13.3
Ke, W. et al., Adv. Mater. 28, 5214–5221 (2016)	2016	SnO2	PCBM	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.8
Ke, W. et al., Adv. Mater. 28, 5214–5221 (2016)	2016	SnO2	PCBM	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.4
Ke, W. et al., J. Mater. Chem. A 4, 14276–14283 (2016)	2016	SnO2	0	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK102	16.9
Ke, W. et al., J. Mater. Chem. A 4, 14276–14283 (2016)	2016	SnO2	PCBM	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK102	19.1

Kim, I. S. et al., ACS Appl. Mater. Interfaces 8, 24310–24314 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.3
Kim, A. et al., Nanoscale 8, 6308–6316 (2016)	2016	ZnO	mAl2O3	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11
Kim, J. et al., J. Phys. Chem. C 120, 11262–11267 (2016)	2016	TiO2	0	FAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	4
Kim, J. et al., J. Phys. Chem. C 120, 11262–11267 (2016)	2016	TiO2	0	FAPbI3	one-step	spin	no	DMF+HI	spiro-OMeTAD	Li+TBP	16
Kulbak, M. et al., J. Phys. Chem. Lett. 6, 2452–2456 (2015)	2016	TiO2	mAl2O3	CsPbI3	two-step	spin-dip	no	DMF	no	no	1.1
Kulbak, M. et al., J. Phys. Chem. Lett. 6, 2452–2456 (2015)	2016	TiO2	mTiO2	CsPbI3	two-step	spin-dip	no	DMF	no	no	5.5
Kulbak, M. et al., J. Phys. Chem. Lett. 6, 2452–2456 (2015)	2016	TiO2	mTiO2	CsPbI3	two-step	spin-dip	no	DMF	CBP	no	4.9
Kulbak, M. et al., J. Phys. Chem. Lett. 7, 167–172 (2016)	2016	TiO2	mTiO2	MAPbBr3	two-step	spin-dip	no	DMF	PTAA	no	6.6
Kulbak, M. et al., J. Phys. Chem. Lett. 6, 2452–2456 (2015)	2016	TiO2	mTiO2	CsPbI3	two-step	spin-dip	no	DMF	PTAA	no	6
Kulbak, M. et al., J. Phys. Chem. Lett. 7, 167–172 (2016)	2016	TiO2	mTiO2	CsPbBr3	two-step	spin-dip	no	DMF	PTAA	no	6.2
Kulbak, M. et al., J. Phys. Chem. Lett. 6, 2452–2456 (2015)	2016	TiO2	mAl2O3	CsPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	1.9

Kulbak, M. et al., J. Phys. Chem. Lett. 6, 2452–2456 (2015)	2016	TiO2	mTiO2	CsPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	5
Kumar, Y. et al., Sol. Energy Mater. Sol. Cells 157, 10–17 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	4.9
Kumar, Y. et al., Sol. Energy Mater. Sol. Cells 157, 10–17 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	6.8
Kumar, Y. et al., Sol. Energy Mater. Sol. Cells 157, 10–17 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	3.1
Lan, C. et al., CrystEngComm 18, 9243–9251 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.5
Lee, S. J. et al., J. Am. Chem. Soc. 138, 3974–3977 (2016)	2016	TiO2	mTiO2	FASnI3	one-step	spin 2-3	toluene	DMF+DMSO +SnF2	spiro-OMeTAD	lutidiene+TBP	2.8
Lee, S. J. et al., J. Am. Chem. Soc. 138, 3974–3977 (2016)	2016	TiO2	mTiO2	FASnI3	one-step	spin 2-3	toluene	DMF+DMSO +SnF2+pyrazine	spiro-OMeTAD	lutidiene+TBP	4.8
Lee, J. W. et al., Acc. Chem. Res. 49, 311–319 (2016)	2016	TiO2	0	FAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	11.5
Lee, J. W. et al., Acc. Chem. Res. 49, 311–319 (2016)	2016	TiO2	0	FAPbI3	one-step	spin	diethyl ether	DMF+DMSO +thiourea	spiro-OMeTAD	Li+TBP	14.3
Lei, Y. et al., J. Mater. Chem. A 4, 5474–5481 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	5

Lei, Y. et al., J. Mater. Chem. A 4, 5474–5481 (2016)	2016	ZnO	mZnO	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	8.8
Leyden, M. R. et al., J. Mater. Chem. A 4, 13125–13132 (2016)	2016	TiO2	mTiO2	FAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.3
Leyden, M. R. et al., J. Mater. Chem. A 4, 13125–13132 (2016)	2016	TiO2	mTiO2	FAPbI3	two-step	CVD	no	na	spiro-OMeTAD	Li+TBP	15.6
Li, H. et al., Nanoscale 8, 6379–6385 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	14.7
Li, H. et al., Nanoscale 8, 6379–6385 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	9.9
Li, H. et al., Nanoscale 8, 6379–6385 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.3
Li, H. et al., Sol. Energy 126, 243–251 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.9
Li, M. et al, Adv. Energy Mater. 6, 1601156 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	no	14.8
Li, M. et al, Adv. Energy Mater. 6, 1601156 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	CuSCN	18
Li, M. et al, Adv. Energy Mater. 6, 1601156 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	CuI	16.7
Li, M. et al., ChemSusChem 9, 2862–2869 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin 2-3	chlorobenzene	DMF	Chl-1	no	11.5

Li, M. et al., ChemSusChem 9, 2862–2869 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin 2-3	chlorobenzene	DMF	Chl-2	no	8.1
Li, M. et al., ChemSusChem 9, 2862–2869 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin 2-3	chlorobenzene	DMF	P3HT	Li+TBP	8.9
Li, X. et al., ACS Appl. Mater. Interfaces 8, 21358– 21365 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	16.4
Li, X. et al., ACS Appl. Mater. Interfaces 8, 21358– 21365 (2016)	2016	TiO2	TiO2	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	18.2
Li, J. et al., Nanoscale 8, 14163– 14170 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	12.3
Li, J. et al., Nanoscale 8, 14163– 14170 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	9.7
Li, F. et al., Chem. Commun. 52, 5394– 5397 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.8
Li, F. et al., Chem. Commun. 52, 5394– 5397 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.5
Li, F. et al., J. Mater. Chem. A 4, 11372– 11380 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-spray	no	DMF	spiro-OMeTAD	Li+TBP	10.8
Li, F. et al., J. Mater. Chem. A 4, 11372– 11380 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-spray	no	DMF	spiro-OMeTAD	Li+TBP	14.5
Li, F. et al., J. Mater. Chem. A 4, 11372– 11380 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-spray	no	DMF	spiro-OMeTAD	Li+TBP	7.6

Li, Y. et al., J. Power Sources 320, 204–211 (2016)	2016	ZnO	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.5
Liu, L. et al., Electrochim. Acta 222, 933–937 (2016)	2016	TiO2	TiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.6
Liu, L. et al., Electrochim. Acta 222, 933–937 (2016)	2016	TiO2	TiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.5
Liu, D. et al., RSC Adv. 6, 51279–51285 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.3
Liu, Z. et al., Nanoscale 8, 7017–7023 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	GBL	no	no	6.9
Liu, J. et al., Electrochim. Acta 195, 143–149 (2016)	2016	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.9
Liu, J. et al., Electrochim. Acta 195, 143–149 (2016)	2016	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.9
Luo, S. et al., Mater. Lett. 169, 236–240 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	5.4
Luo, S. et al., Mater. Lett. 169, 236–240 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11
Mali, S. S. et al., Nanoscale 8, 2664–2677 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP	9.7
Mali, S. S. et al., Nanoscale 8, 2664–2677 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP	11.1

Mali, S. S. et al., Nanoscale 8, 2664–2677 (2016)	2016	TiO2	TiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP	14.9
Mali, S. S. et al., Nanoscale 8, 2664–2677 (2016)	2016	TiO2	TiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP	11.2
Marco, N. De et al., Nano Lett. 16, 1009–1016 (2016)	2016	TiO2	0	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.4
Marco, N. De et al., Nano Lett. 16, 1009–1016 (2016)	2016	TiO2	0	GA:MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	17.1
McMeekin, D. P. et al., Science 351, 151–5 (2016)	2016	SnO2	PCBM	FA0.83Cs0.17Pb(I0.6Br0.4)3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	17.1
Murugadoss, G. et al., J. Power Sources 307, 891–897 (2016)	2016	SnO2	0	MAPbI3	two-step	spin	no	DMF	CuSCN	no	8.4
Nejand, B. A. et al., ChemSusChem 9, 302–313 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	Cu2O	no	4
Nejand, B. A. et al., ChemSusChem 9, 302–313 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	two-step	spin	no	DMF	Cu2O	no	8.9
Nejand, B. A. et al., ChemSusChem 9, 302–313 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	11.5
Nejand, B. A. et al., J. Phys. Chem. C 120, 2520–2528 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	sprayroll	no	DMF	spiro-OMeTAD	Li+TBP	13.2
Nejand, B. A. et al., J. Phys. Chem. C 120, 2520–2528 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spray	no	DMF	spiro-OMeTAD	Li+TBP	8.2

Nejand, B. A. et al., Sci. Rep. 6, 33649 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.3
Nejand, B. A. et al., Sci. Rep. 6, 33649 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spray	no	na	spiro-OMeTAD	Li+TBP	9.1
Niu, G. et al., Nano Energy 27, 87–94 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP	15.1
Niu, G. et al., Nano Energy 27, 87–94 (2016)	2016	TiO2	mTiO2	(MAPbI3)0.9 (CsPbBr3)0.1	one-step	spin 2-3	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP	17.6
Nourolahi, H. et al., Sol. Energy 139,475–483 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	4.6
Nourolahi, H. et al., Sol. Energy 139, 475–483 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	6.2
Pascoe, A. R. et al., Adv. Funct. Mater. 26, 1278–1285 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.3
Pascoe, A. R. et al., Nano Energy 22, 439–452 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	14.2
Pascoe, A. R. et al., Nano Energy 22, 439–452 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	8.8
Pascoe, A. R. et al., Nano Energy 22, 439–452 (2016)	2016	TiO2	mAl2O3	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	10.6
Pascoe, A. R. et al., Nano Energy 22, 439–452 (2016)	2016	TiO2	mAl2O3	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	4.9

Pascoe, A. R. et al., Nano Energy 22, 439–452 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	16
Pascoe, A. R. et al., Nano Energy 22, 439–452 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	14
Pascoe, A. R. et al., Nano Energy 22, 439–452 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	10.2
Pearson, A. J. et al., Adv. Energy Mater. 6, 1600014 (2016)	2016	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.1
Peng, G. et al., J. Mater. Chem. A 4, 1520–1530 (2016)	2016	0	TiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP	12
Peng, G. et al., J. Mater. Chem. A 4, 1520–1530 (2016)	2016	0	TiO2	MAPbI3	one-step	spin 2-3	no	GBL	spiro-OMeTAD	Li+TBP	10
Ramirez, D. et al., J. Phys. Chem. C 120, 8559–8567 (2016)	2016	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.9
Rapsomanikis, A. et al., Sol. Energy Mater. Sol. Cells 151, 36–43 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin 2-3	no	DMF	P3HT	Li+TBP	13.7
Ren, X. et al., Nanoscale 8, 3816–3822 (2016)	2016	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	12.9
Reyna, Y. et al., Nano Energy 30, 570–579 (2016)	2016	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	14.6
Saliba, M. et al., Energy Environ. Sci. 9, 1989–1997 (2016)	2016	TiO2	mTiO2	Cs5(MA0.17FA0.83)95P	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	21.2

				b (I0.83Br0.17) 3							
Saliba, M. et al., Energy Environ. Sci. 9, 1989–1997 (2016)	2016	TiO2	mTiO2	Cs10(MA0.17FA0.83)90 P b(I0.83Br0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	21
Saliba, M. et al., Energy Environ. Sci. 9, 1989–1997 (2016)	2016	TiO2	mTiO2	(MA0.17FA0 . 83)100Pb(I0. 83Br0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	17.4
Saliba, M. et al., Science 354, 206–209 (2016)	2016	TiO2	mTiO2	Rb/Cs/MA/F A cations	one-step	spin 2-3	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	21.8
Sedighi, R. et al., ChemPhysChem 17, 2382–2388 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	13.5
Sedighi, R. et al., ChemPhysChem 17, 2382–2388 (2016)	2016	TiO2	mTiO2	MAPbI3- xBrx	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	10.5
Sedighi, R. et al., ChemPhysChem 17, 2382–2388 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	11.6
Seo, M.-S. et al, Nanoscale 8, 11472–11479 (2016)	2016	TiO2	TiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.5
Seo, M.-S. et al, Nanoscale 8, 11472–11479 (2016)	2016	TiO2	TiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.6

Sfyri, G. et al., Appl. Surf. Sci. 360, 767–771 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	CuMePc	no	5
Shaikh, S. F. et al., J. Mater. Chem. A 4, 15478–15485 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.8
Shaikh, S. F. et al., J. Mater. Chem. A 4, 15478–15485 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	11.1
Shin, S. S. et al., J. Phys. Chem. Lett. 7, 1845–1851 (2016)	2016	Zn2SnO4	0	MAPbI3	two-step	spin	toluene	DMF	PTAA	no	17.6
Song, J. et al., J. Mater. Chem. A 4, 8435–8443 (2016)	2016	ZnO	0	FAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14.1
Song, J. et al., J. Mater. Chem. A 4, 8435–8443 (2016)	2016	ZnO	0	FAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	16.1
Song, J. et al., J. Mater. Chem. A 4, 8435–8443 (2016)	2016	ZnO	0	FAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11
Song, S. et al., Nano Energy 28, 269–276 (2016)	2016	PEIE	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.5
Song, S. et al., Nano Energy 28, 269–276 (2016)	2016	0	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.4
Song, S. et al., Nano Energy 28, 269–276 (2016)	2016	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11
Song, S. et al., Nano Energy 28, 269–276 (2016)	2016	PEIE	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.1

Song, S. et al., Nano Energy 28, 269–276 (2016)	2016	no	no	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	4.7
Song, J. et al., Sol. Energy Mater. Sol. Cells 144, 623–630 (2016)	2016	SnO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12.4
Song, J. et al., Sol. Energy Mater. Sol. Cells 144, 623–630 (2016)	2016	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.9
Song, J. et al., Sol. Energy Mater. Sol. Cells 144, 623–630 (2016)	2016	SnO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14.3
Song, D. H. et al., J. Power Sources 310, 130–136 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin 2-3	no	DMSO	PTAA	Li+TBP	11.6
Song, D. H. et al., J. Power Sources 310, 130–136 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin 2-3	no	DMSO	PTAA	Li+TBP	15.6
Su, P. Y. et al., Electrochim. Acta 209, 529–540 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	SP-no1-Co	no	13.9
Su, P. Y. et al., Electrochim. Acta 209, 529–540 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	SP-no1	no	12.4
Su, P. Y. et al., Electrochim. Acta 209, 529–540 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	H1no1	no	11.6
Su, P. Y. et al., Electrochim. Acta 209, 529–540 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	SP-no2	no	6.5

Su, P. Y. et al., Electrochim. Acta 209, 529–540 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	14.7
Su, P. Y. et al., Electrochim. Acta 209, 529–540 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	13
Supasai, T. et al., Sol. Energy 136, 515–524 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	P3HT	no	6.5
Tai, Q. et al., Nat. Commun. 7, 11105 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.3
Tai, Q. et al., Nat. Commun. 7, 11105 (2016)	2016	TiO2	mTiO2	MAPb(SCN) xI3-x	two-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	15.1
Tai, Q. et al., Nat. Commun. 7, 11105 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	8.8
Tai, Q. et al., Nat.Commun. 7, 11105 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	12.4
Tang, J. F. et al., Sol. Energy Mater. Sol. Cells 154, 18–22 (2016)	2016	ZnO	0	MAPbI3	one-step	spin	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	11.3
Tang, J. F. et al., Sol. Energy Mater. Sol. Cells 154, 18–22 (2016)	2016	0	cZnO-nanowire	MAPbI3	one-step	spin	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	13.6
Tavakoli, M. M. et al., J. Phys. Chem. C 120, 19531–19536 (2016)	2016	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.5
Tavakoli, M. M. et al., J. Phys. Chem. C 120, 19531–19536 (2016)	2016	TiO2	Rgs	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	17.2

Tavakoli, M. M. et al., J. Phys. Chem. C 120, 19531–19536 (2016)	2016	TiO2	2D-graphene	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15.3
Tseng, Z.-L. et al., Nano Energy 28, 311–318 (2016)	2016	ZnO	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.1
Tseng, Z.-L. et al., Nano Energy 28, 311–318 (2016)	2016	AZO	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	17.6
Wang, J. et al., Electrochim. Acta 210, 673–680 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	HBZ-7no	no	4.5
Wang, J. et al., Electrochim. Acta 210, 673–680 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	5.1
Wang, Z. et al., Org. Electron. physics, Mater. Appl. 33, 142–149 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	PDTSTTz-4	Li+TBP	13.9
Wang, Z. et al., Org. Electron. physics, Mater. Appl. 33, 142–149 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	PDTSTTz	Li+TBP	13.3
Wang, Z. et al., Org. Electron. physics, Mater. Appl. 33, 142–149 (2016)	2016	TiO2	C60	MAPbI3-xClx	one-step	spin	no	DMF	PDTSTTz-4	Li+TBP	15.8
Wang, Z. et al., Org. Electron. physics, Mater. Appl. 33, 142–149 (2016)	2016	TiO2	C60	MAPbI3-xClx	one-step	spin	no	DMF	PDTSTTz	Li+TBP	14.4
Wang, Z. et al., Org. Electron. physics, Mater. Appl. 33, 142–149 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	Li+TBP	12.5

Wang, Z. et al., Org.Electron. physics, Mater. Appl. 33, 142–149 (2016)	2016	TiO2	C60	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	Li+TBP	14.3
Wang, Z. et al., Org. Electron. physics, Mater. Appl. 33, 142–149 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.9
Wang, Z. et al., Org. Electron. physics, Mater. Appl. 33, 142–149 (2016)	2016	TiO2	C60	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.6
Wang, S. et al., Nanoscale 8, 6600–6608 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	12
Wang, S. et al., Nanoscale 8, 6600–6608 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	14.6
Wang, S. et al., Nanoscale 8, 6600–6608 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	12.2
Wang, S. et al., Nanoscale 8, 6600–6608 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	10.1
Wang, S. et al., Nanoscale 8, 6600–6608 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	7.3
Wang, S. et al., Nanoscale 8, 6600–6608 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	6.8
Wang, W. et al., Nanoscale Res. Lett. 11, 316 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	no	12.4

Wang, W. et al., Nanoscale Res. Lett. 11, 316 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	no	10.6
Wang, F. et al., Nanoscale 8, 11882–11888 (2016)	2016	TiO2	no	MAPbI3	one-step	spin	toluene	DMSO	SWNT-GO	no	11.7
Wang, F. et al., Nanoscale 8, 11882–11888 (2016)	2016	TiO2	no	MAPbI3	one-step	spin	toluene	DMSO	spiro-OMeTAD	Li+TBP	12.1
Wang, F. et al., Adv. Mater. 28, 9986–9992 (2016)	2016	TiO2	0	FAPbI3	one-step	spin 2-3	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	19.2
Wang, F. et al., Adv. Mater. 28, 9986–9992 (2016)	2016	TiO2	0	FAPbI3	one-step	spin 2-3	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	11.8
Wang, W. et al., J. Mater. Sci. Mater. Electron. 27, 9384–9390 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	11.9
Wang, W. et al., J. Mater. Sci. Mater. Electron. 27, 9384–9390 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin 2-3	no	DMF+H3PO2	spiro-OMeTAD	Li+TBP	12.4
Wei, Q. et al., RSC Adv. 6, 56807–56811 (2016)	2016	TiO2	0	FAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	14.3
Wei, Q. et al., RSC Adv. 6, 56807–56811 (2016)	2016	TiO2	0	FAPbI3	one-step	spin	no	DMSO+GBL+CN	spiro-OMeTAD	Li+TBP	16.5
Wei, J. et al., Nano Energy 26, 139–147 (2016)	2016	TiO2	no	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.5
Wei, J. et al., Nano Energy 26, 139–147 (2016)	2016	TiO2	no	MAPbI3-xClx	one-step	spin	no	DMF+PCBM	spiro-OMeTAD	Li+TBP	14.2

Wei, J. et al., Nano Energy 26, 139–147 (2016)	2016	TiO2	no	MAPbI3-xClx	one-step	spin	no	DMF+PCBM+ PEG	spiro-OMeTAD	Li+TBP	17.1
Wei, J. et al., Nano Energy 26, 139–147 (2016)	2016	TiO2	no	MAPbI3-xClx	one-step	spin	no	DMF+PEG	spiro-OMeTAD	Li+TBP	16.3
Wei, Q. et al., Sol. Energy 135, 654–661 (2016)	2016	no	no	MAPbI3	one-step	spin	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP	10.2
Wei, Q. et al., Sol. Energy 135, 654–661 (2016)	2016	no	no	MAPbI3	one-step	spin	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP	10.1
Wei, Q. et al., Sol. Energy 135, 654–661 (2016)	2016	no	no	MAPbI3	one-step	spin	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP	10
Wu, C. et al., J. Phys. Chem. C 120, 26710–26719 (2016)	2016	TiO2	0	FAPbI3-xBrx	two-step	spin	no	NMP	spiro-OMeTAD	Li+TBP+FK 209	14
Wu, C. et al., J. Phys. Chem. C 120, 26710–26719 (2016)	2016	TiO2	mTiO2	FAPbI3-xBrx	two-step	spin	no	NMP	spiro-OMeTAD	Li+TBP+FK 209	15.5
Wu, W. Q. et al., J. Power Sources 329, 17–22 (2016)	2016	no	no	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	2.7
Wu, W. Q. et al., J. Power Sources 329, 17–22 (2016)	2016	0	TiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.7
Xiao, Y. et al., J. Power Sources 306, 171–177 (2016)	2016	TiO2	0	MAPbI3	two-step	spin 2-3-dip	no	GBL	PEDOT	no	12.4
Xiong, H. et al., J. Mater. Chem. C 4, 6848–6854 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	no	12.4

Xiong, H. et al., J. Mater. Chem. C 4, 6848–6854 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	no	11.3
Yan, J.-J. et al., Superlattices Microstruct. 94, 196– 203 (2016)	2016	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	P3HT	Li+TBP	8.6
Yang, Y. et al., J. Alloys Compd. 684, 84–90 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.8
Yang, Y. et al., J. Alloys Compd. 684, 84–90 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+BAI	spiro-OMeTAD	Li+TBP	9.1
Yang, Y. et al., J. Alloys Compd. 684, 84–90 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+NH4I	spiro-OMeTAD	Li+TBP	9.5
Yang, S. et al., J. Mater. Chem. A 4, 9430–9436 (2016)	2016	TiO2	0	FAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	5.9
Yang, S. et al., J. Mater. Chem. A 4, 9430–9436 (2016)	2016	TiO2	0	FAPbI3	one-step	spin	no	DMF+NH4SCN	spiro-OMeTAD	Li+TBP	11.4
Ahmadian-Yazdi, M. R. et al., Nanoscale Res. Lett. 11, 408 (2016)	2016	TiO2	0	MAPbI3-xClx	two-step	spin-dip	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	3.5
Ahmadian-Yazdi, M. R. et al., Nanoscale Res. Lett. 11, 408 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin 2-3	toluene	DMSO	spiro-OMeTAD	Li+TBP	7.3
Ye, J. et al., Sol. Energy 136, 505–514 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	15.9
Ye, J. et al., Sol. Energy 136, 505–514 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene +acetonitrile	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	18.3

Ye, J. et al., RSC Adv. 6, 36356–36361 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	P3HT	no	13.8
Ye, J. et al., RSC Adv. 6, 36356–36361 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	P3HT	no	8.2
Yi, Y. et al., RSC Adv. 6, 82759–82762 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	no	no	4.4
Yi, Y. et al., RSC Adv. 6, 82759–82762 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	no	no	0.1
Yin, X. et al., ACS Appl. Mater. Interfaces 8, 29580–29587 (2016)	2016	TiZn2O4	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.1
Yoon, H. et al., Energy Environ. Sci. 9, 2262–2266 (2016)	2016	BCP	C60	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.1
Yu, X. et al., J. Power Sources 325, 534–540 (2016)	2016	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	no	10.5
Yu, X. et al., J. Power Sources 325, 534–540 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	no	10.7
Yu, X. et al., J. Power Sources 325, 534–540 (2016)	2016	TiO2	mSiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	no	15.8
Yu, Y. et al.,ChemSusChem 9, 3288–3297 (2016)	2016	SnO2	C60-SAM	FAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.2
Yu, Y. et al., ChemSusChem 9, 3288–3297 (2016)	2016	SnO2	C60- SAM	FA0.8Cs0.2 P bI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.6

Yu, Y. et al., ChemSusChem 9, 3288–3297 (2016)	2016	SnO2	C60- SAM	FA0.8Cs0.2PbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.6
Yu, M. et al., Chem. Phys. Lett. 662, 257–262 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.2
Yu, M. et al., Chem. Phys. Lett. 662, 257–262 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.4
Yuan, Z. et al., ACS Appl. Mater. Interfaces 8, 34446–34454 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.8
Yuan, Z. et al., ACS Appl. Mater. Interfaces 8, 34446–34454 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	16.6
Yuan, M. et al., Electrochim. Acta 215, 374–379 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	CZTS-QD	no	10.7
Yuan, M. et al., Electrochim. Acta 215, 374–379 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	CZTSe-QD	no	9.7
Yuan, S. et al., RSC Adv. 6, 47459–47467 (2016)	2016	TiO2	PCBM	MAPbI3	two-step	vasp	no	na	spiro-OMeTAD	Li+TBP	15.6
Zhang, Y. et al., Chem. Commun. 52, 5674–5677 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	12.5
Zhang, Y. et al., Chem. Commun. 52, 5674–5677 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF+CNT	spiro-OMeTAD	Li+TBP	10.3

Zhang, Y. et al., Chem. Commun. 52, 5674–5677 (2016)	2016	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF+s-CNT	spiro-OMeTAD	Li+TBP	15.2
Zhang, F. et al., Synth. Met. 220, 187–193 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14
Zhang, F. et al., Synth. Met. 220, 187–193 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.6
Zhang, F. et al., Synth. Met. 220, 187–193 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.6
Zhang, F. et al., Chem. Mater. 28, 802–812 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.6
Zhang, F. et al., Chem. Mater. 28, 802–812 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.6
Zhang, F. et al., Chem. Mater. 28, 802–812 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	5.8
Zhang, F. et al., Chem. Mater. 28, 802–812 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	5
Zhang, H. et al., J. Mater. Chem. A 4, 8724–8733 (2016)	2016	PDI	0	MAPbI3-xClx	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.7
Zhang, H. et al., J. Mater. Chem. A 4, 8724–8733 (2016)	2016	no	no	MAPbI3-xClx	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	12.9
Zhang, X. et al., J. Alloys Compd. 681, 191–196 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	no	8.6

Zhang, X. et al., J. Alloys Compd. 681, 191–196 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	no	12.1
Zhang, C. Z. et al., Opt. Quantum Electron. 48, 550 (2016)	2016	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.4
Zhao, B. G. et al., J. Mater. Sci. Mater. Electron. 27, 10869–10876 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.1
Zhao, B. G. et al., J. Mater. Sci. Mater. Electron. 27, 10869–10876 (2016)	2016	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.3
Zhao, Q. et al., Sci. Rep. 6, 38670 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13
Zhao, Q. et al., Sci. Rep. 6, 38670 (2016)	2016	TiO2	0	MAPbI3	one-step	spin	no	DMF+HAc	spiro-OMeTAD	Li+TBP	14.7
Zhou, Z. et al., RSC Adv. 6, 78585–78594 (2016)	2016	TiO2	0	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	10.6
Zhou, Z. et al., RSC Adv. 6, 78585–78594 (2016)	2016	TiO2	C60	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	16.6
Zhou, Z. et al., Chem. Commun. 52, 3828–3831 (2016)	2016	TiO2	mTiO2	MAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	14.8
Zhou, Z. et al., Chem. Commun. 52, 3828–3831 (2016)	2016	TiO2	mTiO2	FAPbI3	two-step	vasp	no	DMF	spiro-OMeTAD	Li+TBP	12.4

Zhou, P. et al., Sol. Energy 137, 579–584 (2016)	2016	TiO2	SnO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.2
Zuo, L. et al., J. Am. Chem. Soc. 138, 15710–15716 (2016)	2016	SnO2	0	MAPbI3-xClx	two-step	spin-drip	no	DMF	spiro-OMeTAD	Li+TBP	19.2
Zuo, L. et al., J. Am. Chem. Soc. 138, 15710–15716 (2016)	2016	SnO2	0	MAPbI3-xClx	two-step	spin-drip	no	DMF	spiro-OMeTAD	Li+TBP	18.2
Zuo, L. et al., J. Am. Chem. Soc. 138, 15710–15716 (2016)	2016	SnO2	0	MAPbI3-xClx	two-step	spin-drip	no	DMF	spiro-OMeTAD	Li+TBP	17.3
Aeineh, N. et al., ACS Appl. Mater. Interfaces 9, 13181–13187 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.4
Aeineh, N. et al., ACS Appl. Mater. Interfaces 9, 13181–13187 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.2
Aeineh, N. et al., ACS Appl. Mater. Interfaces 9, 13181–13187 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.6
An, Q. et al., Nano Energy 39, 400–408 (2017)	2017	ZnO	0	MAPbI3	one-step	spin	no	DMF+HP	spiro-OMeTAD	Li+TBP	6.5
An, Q. et al., Nano Energy 39, 400–408 (2017)	2017	ZnO-Li	0	MAPbI3	one-step	spin	no	DMF+HP	spiro-OMeTAD	Li+TBP	9.6
An, Q. et al., Nano Energy 39, 400–408 (2017)	2017	ZnO-Cs	0	MAPbI3	one-step	spin	no	DMF+HP	spiro-OMeTAD	Li+TBP	9.5

An, Q. et al., Nano Energy 39, 400–408 (2017)	2017	ZnO	PCBA	MAPbI3	one-step	spin	no	DMF+HP	spiro-OMeTAD	Li+TBP	15.5
An, Q. et al., Nano Energy 39, 400–408 (2017)	2017	ZnO-Li	PCBA	MAPbI3	one-step	spin	no	DMF+HP	spiro-OMeTAD	Li+TBP	18.5
An, Q. et al., Nano Energy 39, 400–408 (2017)	2017	ZnO-Cs	PCBA	MAPbI3	one-step	spin	no	DMF+HP	spiro-OMeTAD	Li+TBP	17.5
Apostolopoulou, A. et al., Sol. Energy Mater. Sol. Cells 166, 100–107 (2017)	2017	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	Li+TBP	12.9
Apostolopoulou, A. et al., Sol. Energy Mater. Sol. Cells 166, 100–107 (2017)	2017	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	Li+TBP	10
Barbé, J. et al., ACS Appl. Mater. Interfaces 9, 11828–11836 (2017)	2017	TiO2	0	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP+FK 102	12.8
Barbé, J. et al., ACS Appl. Mater. Interfaces 9, 11828–11836 (2017)	2017	SnO2	PCBM	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP+FK 102	14.8
Batmunkh, M. et al., ChemSusChem 10, 3750–3753 (2017)	2017	TiO2	mTiO2	CsI, FAI, PbI2, MABr, PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 102	15.2
Batmunkh, M. et al., ChemSusChem 10, 3750–3753 (2017)	2017	TiO2	mTiO2	CsI, FAI, PbI2, MABr, PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 102	17.7
Batmunkh, M. et al., ACS Appl. Mater. Interfaces 9, 19945–19954 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO	spiro-OMeTAD	Li+TBP+FK 102	13.5

Batmunkh, M. et al., ACS Appl. Mater. Interfaces 9, 19945–19954 (2017)	2017	TiO2	TiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO	spiro-OMeTAD	Li+TBP+FK102	16.1
Cai, F. et al., J. Mater. Chem. A 5, 9402–9411 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.6
Cai, F. et al., J. Mater. Chem. A 5, 9402–9411 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.8
Cai, F. et al., J. Mater. Chem. A 5, 9402–9411 (2017)	2017	TiO2	C60-ETA	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.6
Cai, F. et al., J. Mater. Chem. A 5, 9402–9411 (2017)	2017	TiO2	PCBM	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.3
Chaudhary, B. et al., ChemSusChem 10, 2473–2479 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15.1
Chaudhary, B. et al., ChemSusChem 10, 2473–2479 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.6
Chen, M. et al., Chem. Eng. J. 313, 791–800 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-drip	no	DMF	no	no	7.9
Chen, M. et al., Chem. Eng. J. 313, 791–800 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-drip	no	DMF	no	no	7.3
Chen, Z. et al., J. Power Sources 351, 123–129 (2017)	2017	SnO2	0	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	7.4
Chen, Z. et al., J. Power Sources 351, 123–129 (2017)	2017	SnO2	PCBM	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.3

Chen, C. et al., ACS Energy Letters 2, 497–503 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	14.8
Chen, C. et al., ACS Energy Letters 2, 497–503 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	18.7
Chen, C. et al., ACS Energy Letters 2, 497–503 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+Cu(b pcm)	18.5
Chen, B.-A. et al., ACS Energy Lett. 2, 342–348 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	14.4
Chen, J. Y. et al., Sol. Energy Mater. Sol. Cells 164, 47–55 (2017)	2017	SnO2	0	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	13.9
Chen, J. Y. et al., Sol. Energy Mater. Sol. Cells 164, 47–55 (2017)	2017	TiO2	0	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	14.1
Chen, J. Y. et al., Sol. Energy Mater. Sol. Cells 164, 47–55 (2017)	2017	TiO2	C60	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	15.3
Cheng, N. et al., Electrochim. Acta 246, 990–996 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	ethanol	DMF	no	no	12.8

Cheng, N. et al., Electrochim. Acta 246, 990–996 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	ethanol	DMF	CuPc	no	16.6
Cheng, N. et al., Electrochim. Acta 246, 990–996 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	ethanol	DMF	CuPc	no	12.1
Cheng, N. et al., Electrochim. Acta 246, 990–996 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	CuPc	no	11.7
Cheng, H. et al., Journal of Energy Chemistry (2017), doi:10.1016/j.jechem. 2017.08.007	2017	TiO2	0	MAPbI3-xClx	two-step	spin	no	DMF	TPADPP-2	Li+TBP	9.9
Cheng, H. et al., Journal of Energy Chemistry (2017), doi:10.1016/j.jechem. 2017.08.007	2017	TiO2	0	MAPbI3-xClx	two-step	spin	no	DMF	PTZDPP-2	Li+TBP	8.2
Cheng, H. et al., Journal of Energy Chemistry (2017), doi:10.1016/j.jechem. 2017.08.007	2017	TiO2	0	MAPbI3-xClx	two-step	spin	no	DMF	TPADPP-1	Li+TBP	5.1
Cheng, H. et al., Journal of Energy Chemistry (2017), doi:10.1016/j.jechem. 2017.08.007	2017	TiO2	0	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.9
Chiang, Y.-H. et al., ACS Appl. Mater. Interfaces 9, 2403–2409 (2017)	2017	TiO2	mTiO2	FA1-xCsxPb(SCN)yI3-y	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.4
Chiang, Y.-H. et al., ACS Appl. Mater. Interfaces 9, 2403–2409 (2017)	2017	TiO2	mTiO2	FA1-xCsxPb(SCN)yI3-y	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.9

Chiang, Y.-H. et al., ACS Appl. Mater. Interfaces 9, 2403–2409 (2017)	2017	TiO2	mTiO2	FA1-xCsxPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	14
Cho, A.-N. et al., J. Mater. Chem. A 5, 7603–7611 (2017)	2017	TiO2	PCBM	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	ACR-TPA	Li+TBP	16.4
Cho, A.-N. et al., J. Mater. Chem. A 5, 7603–7611 (2017)	2017	TiO2	PCBM	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.3
Cimaroli, A. J. et al., J. Mater. Chem. C 5, 10152–10157 (2017)	2017	C60- SAM	0	MA0.7FA0.3PbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	11.8
Cohen, B.-E. et al., Adv. Funct. Mater. 27, 1604733 (2017)	2017	TiO2	0	MAPbBr3	one-step	spin 2-3	toluene	DMSO+GBL	no	no	6.2
Cohen, B.-E. et al., Adv. Funct. Mater. 27, 1604733 (2017)	2017	TiO2	0	(PEA)2(MA)n-1PbnBr3n+1	one-step	spin 2-3	toluene	DMSO+GBL	no	no	6.3
Cohen, B.-E. et al., Adv. Funct. Mater. 27, 1604733 (2017)	2017	TiO2	0	MAPbBr3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP+FK209	8.1
Cohen, B.-E. et al., Adv. Funct. Mater. 27, 1604733 (2017)	2017	TiO2	0	(PEA)2(MA)n-1PbnBr3n+1	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP+FK209	8.5
Conings, B. et al., ACS Appl. Mater. Interfaces 9, 8092–8099 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	17.5

Conings, B. et al., ACS Appl. Mater. Interfaces 9, 8092–8099 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.1
Kosta, I. et al., Electrochim. Acta 246, 1193–1199 (2017)	2017	TiO2	0	MAPbI3	two-step	electrode position-dip	no	na	spiro-OMeTAD	Li+TBP	7.3
Dao, Q. D. et al., Org. Electron. physics, Mater. Appl. 43, 156–161 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	toluene	DMSO	C5PcH2	no	12.2
Dar, M. I. et al., Adv. Funct. Mater. 27, 1701433 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK209	15.3
Dar, M. I. et al., Adv. Funct. Mater. 27, 1701433 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK209	14.5
Dar, M. I. et al., Adv. Funct. Mater. 27, 1701433 (2017)	2017	TiO2	mTiO2	FAPbBr3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK209	5.4
Dar, M. I. et al., Adv. Funct. Mater. 27, 1701433 (2017)	2017	TiO2	mTiO2	FAPbBr3	two-step	spin-dip	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	6.8
Dar, M. I. et al., Adv. Funct. Mater. 27, 1701433 (2017)	2017	TiO2	mTiO2	MAPbBr3	one-step	spin	no	DMF+HBr	spiro-OMeTAD	Li+TBP+FK209	1.4
Deng, X. et al., J. Phys. Chem. Lett. 8, 3206–3210 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.3
Ding, B. et al., J. Mater. Chem. A 5, 6840–6848 (2017)	2017	TiO2	0	FA0.1MA0.9PbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	20.4

Dong, Q. et al., Nano Energy 38, 358–367 (2017)	2017	SnO2	0	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.2
Dong, Q. et al., Nano Energy 38, 358–367 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.3
Dong, Q. et al., Nano Energy 38, 358–367 (2017)	2017	no	no	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.3
Eze, V. O. et al., Org. Electron. physics, Mater. Appl. 46, 253–262 (2017)	2017	WOx	0	MAPbI3	one-step	spin	no	GBL+NMP	spiro-OMeTAD	Li+TBP	13.1
Eze, V. O. et al., Org. Electron. physics, Mater. Appl. 46, 253–262 (2017)	2017	WOx	C60	MAPbI3	one-step	spin	no	GBL+NMP	spiro-OMeTAD	Li+TBP	16.1
Fan, R. et al., J. Mater. Chem. A 5, 12034–12042 (2017)	2017	TiO2	0	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.5
Fan, R. et al., J. Mater. Chem. A 5, 12034–12042 (2017)	2017	TiO2	TiO2	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.8
Fan, R. et al., J. Mater. Chem. A 5, 12034–12042 (2017)	2017	TiO2	0	FAI,MAI,MACl,MABr,PbI2	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	18.2
Fan, R. et al., J. Mater. Chem. A 5, 12034–12042 (2017)	2017	TiO2	TiO2	FAI,MAI,MACl,MABr,PbI2	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	20.1
Fei, C. et al., Adv. Energy Mater. 7, 1602017 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.8

Fei, C. et al., Adv. Energy Mater. 7, 1602017 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	ethylacetate	DMF+thiourea	spiro-OMeTAD	Li+TBP	18.5
Fei, C. et al., Adv. Energy Mater. 7, 1602017 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+thiourea	spiro-OMeTAD	Li+TBP	13.4
Gaml, E. A. et al., Sol. Energy Mater. Sol. Cells 168, 8–13 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	11.6
Gaml, E. A. et al., Sol. Energy Mater. Sol. Cells 168, 8–13 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	PBDTT-FTTE	DIO	11.6
Gao, X. et al., Phys. Chem. Chem. Phys. 19, 4956–4961 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.9
Gao, X. et al., Phys. Chem. Chem. Phys. 19, 4956–4961 (2017)	2017	TiO2	TiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.8
Gao, L.-L. et al., J.	2017	TiO2	0	MAPbI3	one-step	spin-MAK	no	DMF	spiro-OMeTAD	Li+TBP	17.7
Gao, C. et al., Chem. Eng. J. 325, 378–385 (2017)	2017	ZnO	SnO2	MAPbI3	one-step	spin	chlorobenzene	DMF	P3HT	no	12.3
Grancini, G. et al., Nat. Commun. 8, 15684 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO	spiro-OMeTAD	no	16
Grancini, G. et al., Nat. Commun. 8, 15684 (2017)	2017	TiO2	mTiO2	3% AVAI-MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO	spiro-OMeTAD	no	14.6

Grisorio, R. et al. ACS Energy Lett. 2, 1029–1034 (2017)	2017	TiO2	mTiO2	CsI, MAI, MABr, PbI2, PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTZ2	Li+TBP+FK209	17.6
Grisorio, R. et al. ACS Energy Lett. 2, 1029–1034 (2017)	2017	TiO2	mTiO2	CsI, MAI, MABr, PbI2, PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTZ1	Li+TBP+FK209	2.1
Grisorio, R. et al. ACS Energy Lett. 2, 1029–1034 (2017)	2017	TiO2	mTiO2	CsI, MAI, MABr, PbI2, PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	17.7
Guo, Y. et al., Nano Energy 38, 193–200 (2017)	2017	Ni-Fe2O3	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	14.1
Guo, Y. et al., Nano Energy 38, 193–200 (2017)	2017	Fe2O3	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	12.3
Guo, J. J. et al., Sol. Energy 155, 121–129 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene +toluene	DMF+DMSO	no	no	7.8
Guo, J. J. et al., Sol. Energy 155, 121–129 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene +toluene	DMF+DMSO	ZnPcNO2-Oph	no	14.5
Guo, J. J. et al., Sol. Energy 155, 121–129 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene +toluene	DMF+DMSO	CuPcNO2-Oph	no	12.8

Guo, J. J. et al., Sol. Energy 155, 121–129 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene +toluene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.9
Ha, S.-J. et al., J. Mater. Chem. A 5, 1972–1977 (2017)	2017	PS	mTiO2	MAPbI3	one-step	spin	toluene	DMSO	PTAA	Li+TBP	17.1
Habisreutinger, S. N. et al., Adv. Energy Mater. 7, 1601079 (2017)	2017	0	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF+H3P	SWNT-PMMA	no	6.5
Habisreutinger, S. N. et al., Adv. Energy Mater. 7, 1601079 (2017)	2017	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF+H3P	SWNT-PMMA	no	16.2
Habisreutinger, S. N. et al., Adv. Energy Mater. 7, 1601079 (2017)	2017	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF+H3P	SWNT-polycarbonate	no	12.6
Habisreutinger, S. N. et al., Adv. Energy Mater. 7, 1601079 (2017)	2017	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF+H3P	SWNT-PMMA	TBP	17.3
Habisreutinger, S. N. et al., Adv. Energy Mater. 7, 1601079 (2017)	2017	TiO2	mAl2O3	MAPbI3-xClx	one-step	spin	no	DMF+H3P	SWNT-polycarbonate	TBP	14
Han, F. et al., J. Power Sources 359, 577–584 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	14.1
Han, F. et al., J. Power Sources 359, 577–584 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF+4MSA	spiro-OMeTAD	Li+TBP	17.6

Han, F. et al., Electrochim. Acta 236, 122–130 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP+FK 209	17.1
Han, F. et al., Electrochim. Acta 236, 122–130 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP+FK 209	14.4
Han, F. et al., Appl. Surf. Sci. 408, 34–37 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	na	spiro-OMeTAD	Li+TBP	13.8
Han, F. et al., Appl. Surf. Sci. 408, 34–37 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene +DMSO	na	spiro-OMeTAD	Li+TBP	16.8
Hatamvand, M. et al., Optik (Stuttg). 140, 443–450 (2017)	2017	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF	no	no	0.3
He, M. et al., Nat. Commun. 8, 16045 (2017)	2017	TiO2	no	FA0.85MA0.15PbI2.55Br0.45	one-step	MASP	no	DMSO	PTAA	Li+TBP	20.4
He, M. et al., Nat. Commun. 8, 16045 (2017)	2017	TiO2	no	FA0.85MA0.15PbI2.55Br0.45	one-step	spin 2-3	no	DMSO	PTAA	Li+TBP	18.3
Hou, Y. et al., Adv. Funct. Mater. 27, 1700878 (2017)	2017	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	12
Hou, Y. et al., Adv. Funct. Mater. 27, 1700878 (2017)	2017	TiO2-SnO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	16.5
Hou, Y. et al., Adv. Funct. Mater. 27, 1700878 (2017)	2017	TiO2-SnO2	0	Cs5(MA0.17FA0.83)95Pb(I0.83Br0.17)3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	18.1

Hou, X. et al., Electrochim. Acta 236, 351–358 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	6.1
Hou, X. et al., Electrochim. Acta 236, 351–358 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	11.3
Hou, X. et al., Electrochim. Acta 236, 351–358 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	7
Hou, X. et al., Electrochim. Acta 236, 351–358 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	12
Hu, W. et al., J. Mater. Chem. A 5, 1434–1441 (2017)	2017	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15.7
Hu, W. et al., J. Mater. Chem. A 5, 1434–1441 (2017)	2017	In2S3	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	18.2
Hu, W. et al., J. Mater. Chem. A 5, 1434–1441 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	15.3
Hu, W. et al., J. Mater. Chem. A 5, 1434–1441 (2017)	2017	α-Fe2O3	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	14.2
Huang, Z.-L. et al., Superlattices Microstruct. 102, 94–102 (2017)	2017	ZnO	Al-ZnO-nanorod	MAPbI3	two-step	spin	no	DMF	P3HT	Li	10.5
Huang, Z.-L. et al., Superlattices Microstruct. 102, 94–102 (2017)	2017	ZnO	ZnO-nanorod	MAPbI3	two-step	spin	no	DMF	P3HT	Li	8
Huang, Y. T. et al., Electrochim. Acta 236, 131–139 (2017)	2017	0	mTiO2	MAPbI3	two-step	spin-dip	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	7.4

Huang, Y. T. et al., Electrochim. Acta 236, 131–139 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	13
Huang, Y. T. et al., Electrochim. Acta 236, 131–139 (2017)	2017	Nb2O5	mTiO2	MAPbI3	two-step	spin-dip	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	14.6
Huckaba, A. J. et al., Small Methods 1, 1700250 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	no	no	8.4
Huckaba, A. J. et al., Small Methods 1, 1700250 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	TiS2	no	13.2
Huckaba, A. J. et al., Small Methods 1, 1700250 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	18.1
Islavath, N. et al., J. Energy Chem. 26, 584–591 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	no	no	1.6
Islavath, N. et al., J. Energy Chem. 26, 584–591 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	CuSCN	no	7.2
Islavath, N. et al., J. Energy Chem. 26, 584–591 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	5
Jiang, X. et al., Sci. Rep. 7, 42564 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85(MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	no	no	8.5

Jiang, X. et al., Sci. Rep. 7, 42564 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85(MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PEDOT	no	17
Jiang, X. et al., Sci. Rep. 7, 42564 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85(MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.6
Jiang, X. et al., Sci. Rep. 7, 42564 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85(MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.2
Jiang, J. et al., J. Mater. Chem. A 5, 9514–9522 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	17.1
Jiang, J. et al., J. Mater. Chem. A 5, 9514–9522 (2017)	2017	ITIC	0	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	11.5
Jiang, J. et al., J. Mater. Chem. A 5, 9514–9522 (2017)	2017	TiO2	ITIC	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	20.1
Jin, J. et al., ACS Appl. Mater. Interfaces 9, acsami.7b15310 (2017)	2017	TiO2	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO	spiro-OMeTAD	Li+TBP	16.4
Jin, J. et al., ACS Appl. Mater. Interfaces 9, acsami.7b15310 (2017)	2017	TiO2	no	MAI(PbI2)0.97(ZnCl2)0.03	one-step	spin 2-3	chlorobenzene	DMSO	spiro-OMeTAD	Li+TBP	18.2
Jodlowski, A. D. et al., Nat. Energy 2, 972–979 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO	spiro-OMeTAD	Li+TBP+FK209	18.9
Jodlowski, A. D. et al., Nat. Energy 2, 972–979 (2017)	2017	TiO2	mTiO2	MA1 每 x GuaxPbI3	one-step	spin 2-3	chlorobenzene	DMSO	spiro-OMeTAD	Li+TBP+FK209	20.2

Jung, K.-H. et al., J. Mater. Chem. A 5, 24790–24803 (2017)	2017	SnO2	0	(FAPbI3)0.87 5(CsPbBr3)0.125	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	18.3
Kavadiya, S. et al., Adv. Energy Mater. 7, 1700210 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-electrospray	no	DMF	spiro-OMeTAD	Li+TBP	12
Kavadiya, S. et al., Adv. Energy Mater. 7, 1700210 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.3
Ke, W. et al., Sci. Adv. 3, e1701293 (2017)	2017	TiO2	mTiO2	en-FASnI3	one-step	spin	no	DMF+DMSO	PTAA	no	7.1
Kırbıyık, Ç. et al., Appl. Surf. Sci. 423, 521–527 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	toluene	GBL	P3HT	no	7.5
Kırbıyık, Ç. et al., Appl. Surf. Sci. 423, 521–527 (2017)	2017	TiO2	SAM	MAPbI3	one-step	spin	toluene	GBL	P3HT	no	11.3
Kim, D. H. et al., Adv. Mater. 29, 1606831 (2017)	2017	TiO2	0	FA0.6MA0.4PbI(3-y)Cly	one-step	spin 2-3	diethyl ether	DMF	spiro-OMeTAD	Li+TBP+FK102	19.7
Kim, D. H. et al., Adv. Mater. 29, 1606831 (2017)	2017	TiO2	0	FA0.6MA0.4PbI(3-y)Cly	one-step	spin 2-3	diethyl ether	DMSO+GBL	spiro-OMeTAD	Li+TBP+FK102	15.7
Kim, C. W. et al., Sci. Rep. 7, 6849 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK209	15.2
Kim, N.-K. et al., Sci. Rep. 7, 4645 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.5

Kim, W. et al., Electrochim. Acta 245, 734–741 (2017)	2017	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.8
Kim, W. et al., Electrochim. Acta 245, 734–741 (2017)	2017	TiO2	mTiO2	MAPbI3-xClx	two-step	dip-spin	no	DMF	spiro-OMeTAD	Li+TBP	12.1
Lee, W. et al., Org. Electron. 51, 404–409 (2017)	2017	0	PCBM	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	12.6
Lee, W. et al., Org. Electron. 51, 404–409 (2017)	2017	PEIE-LiQ	PCBM	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.2
Lee, Y. et al., J. Mater. Chem. A 5, 12729–12734 (2017)	2017	SnO2	0	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA	Li+TBP	13
Lee, Y. et al., J. Mater. Chem. A 5, 12729–12734 (2017)	2017	TiO2	0	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA	Li+TBP	17.7
Lee, Y. et al., J. Mater. Chem. A 5, 12729–12734 (2017)	2017	TiO2-SnO2	0	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA	Li+TBP	19.8
Li, D. et al., Chem. Sci. 8, 4587–4594 (2017)	2017	PFN- 2TNDI	0	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	17.2
Li, D. et al., Chem. Sci. 8, 4587–4594 (2017)	2017	PFN- 2TNDI	0	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16

Li, D. et al., Chem. Sci. 8, 4587–4594 (2017)	2017	no	no	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12
Li, H. et al., RSC Adv. 7, 30422–30427 (2017)	2017	TiO2	0	FA0.9Cs0.1PbI3	two-step	spin-spray	no	DMF	spiro-OMeTAD	Li+TBP	8.7
Li, H. et al., RSC Adv. 7, 30422–30427 (2017)	2017	TiO2	PCBM	FA0.9Cs0.1PbI3	two-step	spin-spray	no	DMF	spiro-OMeTAD	Li+TBP	16.8
Li, B. et al., J. Power Sources 360, 11–20 (2017)	2017	TiO2	mTiO2	CsPbBr3-Cl	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	6.2
Li, B. et al., J. Power Sources 360, 11–20 (2017)	2017	TiO2	mTiO2	CsPbBr3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	5
Li, H. et al., Sol. Energy Mater. Sol. Cells 168, 85–90 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-spray	no	DMF	spiro-OMeTAD	Li+TBP	13.3
Li, H. et al., Sol. Energy Mater. Sol. Cells 168, 85–90 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-spray	no	DMF	spiro-OMeTAD	Li+TBP	15.5
Liu, Q. et al., ChemSusChem 10, 3098–3104 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.4
Liu, Q. et al., ChemSusChem 10, 3098–3104 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+BPO	17.5
Liu, D. et al., RSC Adv. 7, 8295–8302 (2017)	2017	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.4

Liu, D. et al., RSC Adv. 7, 8295–8302 (2017)	2017	Cd2SnO4	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	18.8
Liu, C. et al., J. Phys. Chem. C 121, 6546–6553 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6
Liu, C. et al., J. Phys. Chem. C 121, 6546–6553 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+TBP	spiro-OMeTAD	Li+TBP	12.6
Liu, Y. et al., RSC Adv. 7, 1206–1214 (2017)	2017	TiO2	0	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	8.3
Liu, Y. et al., RSC Adv. 7, 1206–1214 (2017)	2017	TiO2	0	MAPbI3	one-step	spin 2-3	toluene	DMSO+GBL	spiro-OMeTAD	Li+TBP	9.1
Liu, Z. et al., J. Mater. Chem. A 5, 6597–6605 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	no	no	1.8
Liu, Z. et al., J. Mater. Chem. A 5, 6597–6605 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	NiOx	no	16.7
Liu, X. et al., ChemSusChem 10, 968–975 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	TPA-TPM	Li+TBP	15.1
Liu, X. et al., ChemSusChem 10, 968–975 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	DPA-TPM	Li+TBP	9.3
Liu, X. et al., ChemSusChem 10, 968–975 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Ph-TPM	Li+TBP	4.6
Liu, X. et al., ChemSusChem 10, 968–975 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	TPA-TPM	Li+TBP	16.8

Liu, X. et al., ChemSusChem 10, 968–975 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.5
Liu, X. et al., ChemSusChem 10, 968–975 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.4
Long, M. et al., Adv. Energy Mater. 7, 1601882 (2017)	2017	TiO2	0	FAPbI3-xBrx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	19.2
Long, M. et al., Adv. Energy Mater. 7, 1601882 (2017)	2017	TiO2	0	FAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.2
Lu, J. et al., Adv. Energy Mater. 7, 1700444 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	17
Lu, J. et al., Adv.Energy Mater. 7, 1700444 (2017)	2017	TiO2	0	MA1-2xEDAxPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	18.6
Lu, H. et al., Small 13, 1701535 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.9
Luo, H. et al., Energy Technol. 5, 1814–1819 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	no	16.3
Luo, H. et al., Energy Technol. 5, 1814–1819 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO +LiI	spiro-OMeTAD	no	18.3
Luo, Q. et al., Adv. Funct. Mater. 27, 1702090 (2017)	2017	α-Fe2O3	0	MAPbI3	one-step	spin 2-3	toluene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15
Luo, Q. et al., Adv. Funct. Mater. 27, 1702090 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	toluene	DMF+DMSO	spiro-OMeTAD	Li+TBP	13.9

Luo, Q. et al., Adv. Funct. Mater. 27, 1702090 (2017)	2017	α-Fe2O3	m-α-Fe2O3	MAPbI3	one-step	spin 2-3	toluene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.1
Mabrouk, S. et al., Sustain. Energy Fuels 1, 2162–2171 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	11.3
Mabrouk, S. et al., Sustain. Energy Fuels 1, 2162–2171 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF+BMImI	spiro-OMeTAD	Li+TBP+FK 209	18
Mabrouk, S. et al., Sustain. Energy Fuels 1, 2162–2171 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF+Li	spiro-OMeTAD	Li+TBP+FK 209	15.6
Mabrouk, S. et al., Sustain. Energy Fuels 1, 2162–2171 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF+Li	spiro-OMeTAD	Li+TBP+FK 209	17
Mahmud, M. A. et al., Phys. Chem. Chem. Phys. 19, 21033–21045 (2017)	2017	ZnO	0	MA0.6FA0.4PbI3	one-step	spin	no	DMF	FDT	Li+TBP	12.9
Mahmud, M. A. et al., Phys. Chem. Chem. Phys. 19, 21033–21045 (2017)	2017	ZnO	0	MA0.6FA0.4PbI3	one-step	spin	no	DMF	FDT	F4TCNQ	14.7
Mahmud, M. A. et al., Sol. Energy Mater. Sol. Cells 159, 251–264 (2017)	2017	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF+TBP	P3HT	Li+TBP	8.8
Mali, S. S. et al., Nanoscale 9, 3095–3104 (2017)	2017	TiO2	0	MAPbI3-xBrx	one-step	spin 2-3	toluene	DMSO+GBL	PTAA	Li+TBP	16.9

Mali, S. S. et al., Mater. Today Chem. 4, 53–63 (2017).	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	carbon+MAI	no	13.9
Mali, S. S. et al., Mater. Today Chem.4, 53–63 (2017).	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15
Mali, S. S. et al., J. Mater. Chem. A 5, 12340–12353 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	PTAA	Li+TBP	14
Mali, S. S. et al., J. Mater. Chem. A 5, 12340–12353 (2017)	2017	TiO2	TiO2	MAPbI3	one-step	spin	no	GBL	PTAA	Li+TBP	14.9
Mali, S. S. et al., J. Mater. Chem. A 5, 12340–12353 (2017)	2017	TiO2	TiO2	MAPbI3	one-step	spin	no	GBL	PTAA	Li+TBP	14.7
Mali, S. S. et al., J. Mater. Chem. A 5, 12340–12353 (2017)	2017	TiO2	TiO2	MAPbI3-xClx	one-step	spin	no	GBL	PTAA	Li+TBP	15.9
Mali, S. S. et al., J. Mater. Chem. A 5, 12340–12353 (2017)	2017	TiO2	TiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin	no	GBL	PTAA	Li+TBP	17.6
Mali, S. S. et al., J. Mater. Chem. A 5, 12340–12353 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	11.9
Mali, S. S. et al., J. Mater. Chem. A 5, 12340–12353 (2017)	2017	TiO2	TiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	15
Mali, S. S. et al., J. Mater. Chem. A 5, 12340–12353 (2017)	2017	TiO2	TiO2	MAPbI3	one-step	spin	no	GBL	spiro-OMeTAD	Li+TBP	12.5
Mu, C. et al., Adv. Energy Mater. 7, 1601297 (2017)	2017	TiO2	0	FAPbI2.8Cl0.2	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK209	17.4

Mu, C. et al., Adv. Energy Mater. 7, 1601297 (2017)	2017	TiO2	0	FAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	15.7
Nia, N. Y. et al., ChemSusChem 10, 3854–3860 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	P3HT	Li+TBP	16.9
Nia, N. Y. et al., ChemSusChem 10, 3854–3860 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	17.8
Paek, S. et al., Adv. Mater. 29, 1606555 (2017)	2017	TiO2	mTiO2	PbI2, FAI, PbBr2, MABr	one-step	spin	trifluorotoluene	DMF+DMSO	FA-CN	no	18.9
Paek, S. et al., Adv. Mater. 29, 1606555 (2017)	2017	TiO2	mTiO2	PbI2, FAI, PbBr2, MABr	one-step	spin	trifluorotoluene	DMF+DMSO	TPA-CN	no	17.5
Paek, S. et al., Adv. Mater. 29, 1606555 (2017)	2017	TiO2	mTiO2	PbI2, FAI, PbBr2, MABr	one-step	spin	trifluorotoluene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	19.2
Peng, J. et al., Adv. Energy Mater. 7, 1601768 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.3
Peng, J. et al., Adv. Energy Mater. 7, 1601768 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.1
Peng, J. et al., Adv. Energy Mater. 7, 1601768 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.9
Peng, J. et al., Adv. Energy Mater. 7, 1601768 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.8
Peng, J. et al., Adv. Energy Mater. 7, 1601768 (2017)	2017	TiO2	mTiO2	Cs0.05(MA0.17FA0.83)0.98Pb(I83Br0.	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.8

				17)							
Peng, J. et al., Adv. Energy Mater. 7, 1601768 (2017)	2017	TiO2	mTiO2	Cs0.05(MA0.17FA0.83)0.98Pb(I83Br0.17)	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.3
Peng, J. et al., Adv. Energy Mater. 7, 1601768 (2017)	2017	TiO2	mTiO2	Cs0.05(MA0.17FA0.83)0.98Pb(I83Br0.17)	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.1
Peng, J. et al., Adv. Energy Mater. 7, 1601768 (2017)	2017	TiO2	mTiO2	Cs0.05(MA0.17FA0.83)0.98Pb(I83Br0.17)	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.6
Pham, N. D. et al., J. Mater. Chem. A 5, 5195–5203 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.1
Pham, N. D. et al., J. Mater. Chem. A 5, 5195–5203 (2017)	2017	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.9
Prathapani, S. et al., Appl. Mater. Today 7, 112–119 (2017)	2017	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	8.1
Pratyusha, T. et al., Mater. Today Proc. 4, 6820–6826 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	PCDTBT-PCPDTBT	no	5.1

Pratyusha, T. et al., Mater. Today Proc. 4, 6820–6826 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	PCDTBT	no	4.4
Qiu, W. et al., Adv. Funct. Mater. 27, 1700920 (2017)	2017	TiO2	PCBM	FAPbI2.85Br0.15	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.6
Qiu, W. et al., Adv. Funct. Mater. 27, 1700920 (2017)	2017	TiO2	PCBM	FAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.5
Qiu, W. et al., Adv. Funct. Mater. 27, 1700920 (2017)	2017	TiO2	PCBM	Cs0.1FA0.9MA0.34PbI2.865Br0.135	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.3
Qiu, W. et al., Adv. Funct. Mater. 27, 1700920 (2017)	2017	TiO2	PCBM	Cs0.2FA0.8PbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.5
Qiu, L. et al., J. Phys. Chem. B 122, acs.jpcb.7b03921 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.5
Qiu, L. et al., J. Phys. Chem. B 122, acs.jpcb.7b03921 (2017)	2017	no	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	13.5
Qiu, Z. et al., J. Am.Ceram. Soc. 100, 176–184 (2017)	2017	ZnO	PCBM	MAPbI3-xClx	two-step	spin	no	DMF	P3HT	no	7.5
Rajmohan, G. D. et al., Thin Solid Films 636, 307–313 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	9.3
Ren, Y. K. et al., J. Alloys Compd. 705, 205–210 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	9.6
Ren, Y. K. et al., J. Alloys Compd. 705, 205–210 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.4

Sanehira, E. M. et al., Sci. Adv. 3, eaao4204 (2017)	2017	TiO2	0	CsPbI3 QD	two-step	spin-dip	no	na	spiro-OMeTAD	Li+TBP	8.5
Sanehira, E. M. et al., Sci. Adv. 3, eaao4204 (2017)	2017	TiO2	0	FA- CsPbI3 QD	two-step	spin-dip	no	na	spiro-OMeTAD	Li+TBP	13.4
Seo, G. et al., ACS Energy Lett. 2, 1705–1710 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	17.7
Shai, X. et al., Nano Energy 36, 213–222 (2017)	2017	TiO2	0	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.7
Shai, X. et al., Nano Energy 36, 213–222 (2017)	2017	TiO2	0	MASr0.05Pb 0.95I3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.3
Shi, B. et al., Sol. Energy Mater. Sol. Cells 168, 214–220 (2017)	2017	TiO2	0	MAPbI3-xBrx	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.9
Shi, B. et al., Sol. Energy Mater. Sol. Cells 168, 214–220 (2017)	2017	TiO2	0	MAPbI3-xBrx	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.3
Shi, B. et al., Sol. Energy Mater. Sol. Cells 168, 214–220 (2017)	2017	TiO2	0	MAPbI3-xClx	two-step	CVD	no	na	spiro-OMeTAD	Li+TBP	13.2
Shi, B. et al., Sol. Energy Mater. Sol. Cells 168, 214–220 (2017)	2017	TiO2	0	MAPbI3-xClx	two-step	CVD	no	na	spiro-OMeTAD	Li+TBP	13.1
Sidhik, S. et al., J. Phys. Chem. C 121, 4239–4245 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	ethoxyetha ne	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	12.3

Sin, D. H. et al., ACS Appl. Mater. Interfaces 9, 18103–18112 (2017)	2017	ZnO	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	3.1
Sin, D. H. et al., ACS Appl. Mater. Interfaces 9, 18103–18112 (2017)	2017	ZnO- PEG	no	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.5
Sin, D. H. et al., ACS Appl. Mater.Interfaces 9, 18103–18112 (2017)	2017	ZnO- PEG	no	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.1
Sudchanham, J. et al., ChemistrySelect 2, 369–374 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 102	11.7
Sun, M. et al., Appl. Surf. Sci. 416, 124–132 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	7.1
Sun, M. et al., Appl. Surf. Sci. 416, 124–132 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	Me-QTPA	no	9.1
Sun, M. et al., Appl. Surf. Sci. 416, 124–132 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	Me-BPZTPA	no	8.2
Sun, M. et al., Appl. Surf. Sci. 416, 124–132 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	no	5.5
Sun, M. et al., Appl. Surf. Sci. 416, 124–132 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.7
Sun, C. et al., J. Alloys Compd. 722, 196–206 (2017)	2017	BaSnO 3	0	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	11

Sun, M. et al., J. Mater. Chem. A 5, 13448–13456 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.5
Sun, M. et al., J. Mater. Chem. A 5, 13448–13456 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO +2-pyridylthioure a	spiro-OMeTAD	Li+TBP	18.2
Tong, G. et al., RSC Adv. 7, 19457–19463 (2017)	2017	CdS	0	MAPbI3	two-step	vasp	no	na	spiro-OMeTAD	Li+TBP	14.7
Torabi, N. et al., Org. Electron. 48, 211–216 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	5.5
Torabi, N. et al., Org. Electron. 48, 211–216 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	CuPC	no	14.9
Torabi, N. et al., Org. Electron. 48, 211–216 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	13.4
Tu, Y. et al., Sci. Rep. 7, 44603 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.6
Tu, Y. et al., Sci. Rep. 7, 44603 (2017)	2017	TiO2	mTiO2	MAPbI2.86Br 0.14	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	18
Upama, M. B. et al., Org. Electron. 50, 279–289 (2017)	2017	PCBM	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.9
Wang, S. et al., Sol. Energy Mater. Sol. Cells 167, 173–177 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	19.6

Wang, L.-Y. et al., Nanoscale 9, 17893–17901 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diisopropyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.1
Wang, Z. et al., Nat. Energy 2, 17135 (2017)	2017	SnO2	PCBM- N-DPBI	BA0.05(FA0.83Cs0.17)0.95Pb(I0.8Br0.2)3	one-step	spin	no	DMF+HI+HBr	spiro-OMeTAD	Li+TBP	20.5
Wang, Z. et al., Nat. Energy 2, 17135 (2017)	2017	SnO2	PCBM- N-DPBI	FA0.83Cs0.17Pb(I0.6Br0.4)3	one-step	spin	no	DMF+HI+HBr	spiro-OMeTAD	Li+TBP	16.9
Wang, Z. et al., Nat. Energy 2, 17135 (2017)	2017	SnO2	PCBM- N-DPBI	BA0.09(FA0.83Cs0.17)0.91Pb(I0.6Br0.4)3	one-step	spin	no	DMF+HI+HBr	spiro-OMeTAD	Li+TBP	16.6
Wang, Z. et al., Adv. Mater. 29, 1604186 (2017)	2017	C60-N- DPBI	0	MAPbI3-xClx	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	18.3
Wang, Z. et al., Adv. Mater. 29, 1604186 (2017)	2017	C60	0	MAPbI3-xClx	one-step	spin 2-3	no	DMF	spiro-OMeTAD	Li+TBP	17
Wang, X. et al., Electrochim. Acta 245, 839–845 (2017)	2017	TiO2	TiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.4
Wang, X. et al., Electrochim. Acta 245, 839–845 (2017)	2017	TiO2	TiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.1
Wang, X. et al., Electrochim. Acta 245, 839–845 (2017)	2017	TiO2	TiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.1

Wang, X. et al., Optik (Stuttg). 150, 111–116 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.2
Wang, X. et al., Optik (Stuttg). 150, 111–116 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	10.2
Wang, M., Sci. Bull. 62, 249–255 (2017)	2017	no	no	FAPbI3	two-step	spin	no	na	spiro-OMeTAD	no	15.1
Wang, M., Sci. Bull. 62, 249–255 (2017)	2017	no	no	FAPbI3	two-step	spin	no	na	spiro-OMeTAD	no	10.6
Wang, W.-T. et al., ACS Appl. Mater. Interfaces 9, 10743–10751 (2017)	2017	ZnO	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.3
Wang, W.-T. et al., ACS Appl. Mater. Interfaces 9, 10743–10751 (2017)	2017	ZnO	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.1
Wang, F. et al., J. Phys. Chem. C 121, 1562–1568 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	toluene	DMSO	spiro-OMeTAD	Li+TBP	16.4
Wang, F. et al., J. Phys. Chem. C 121, 1562–1568 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	toluene	DMSO	spiro-OMeTAD	Li+TBP	14.6
Wang, L. et al., Electrochim. Acta 235, 640–645 (2017)	2017	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	9.2
Wang, H. et al., ACS Appl. Mater. Interfaces 9, 21756–21762 (2017)	2017	TiO2	0	MAPbI3	one-step	spin 2-3	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	16.7

Wang, L. et al., Energy Storage Mater. 7, 40–47 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	16
Wang, L. et al., Energy Storage Mater. 7, 40–47 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	13.5
Wang, L. et al., Energy Storage Mater. 7, 40–47 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	12.4
Wang, L. et al., Energy Storage Mater. 7, 40–47 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	12.2
Wang, L. et al., Energy Storage Mater. 7, 40–47 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	11.4
Wei, W. et al., J. Mater. Chem. A 5, 7749–7752 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF	no	no	10.1
Wei, W. et al., Ind. Eng. Chem. Res. 56, 1803–1809 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF	no	no	4.7
Wei, W. et al., Ind. Eng. Chem. Res. 56, 1803–1809 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF	no	no	4.4
Wei, W. et al., Ind. Eng. Chem. Res. 56, 1803–1809 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF+graphene	no	no	4.7
Wei, W. et al., Ind. Eng. Chem. Res. 56, 1803–1809 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF+MCN	no	no	10.4

Wu, S. et al., J. Power Sources 359, 303–310 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.3
Wu, S. et al., J. Power Sources 359, 303–310 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF+CuPc(tBu)4	spiro-OMeTAD	Li+TBP	17.3
Wu, F. and Zhu, L., Sol. Energy Mater. Sol. Cells 167, 1–6 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.9
Wu, F. and Zhu, L., Sol. Energy Mater. Sol. Cells 167, 1–6 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	19.1
Wu, F. et al., Dye. Pigment. 143, 356–360 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	JY5	Li+TBP	16.9
Wu, F. et al., Dye. Pigment. 143, 356–360 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	X51	Li+TBP	13.2
Wu, F. et al., Dye. Pigment. 143, 356–360 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.2
Wu, T. et al., J. Power Sources 365, 1–6 (2017)	2017	TiO2	0	Cs0.05(MA0.17FA0.83)0.95Pb(I0.83Br 0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	16
Wu, T. et al., J. Power Sources 365, 1–6 (2017)	2017	TiO2	0	Cs0.05(MA0.17FA0.83)0.95Pb(I0.83Br	one-step	spin 2-3	chlorobenzene	DMF+DMSO +NMP	spiro-OMeTAD	Li+TBP	19.6

				0.17)3							
Xiang, W. et al., J. Mater. Chem. A 5, 5486–5494 (2017)	2017	TiO2	no	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	13.3
Xiang, W. et al., J. Mater. Chem. A 5, 5486–5494 (2017)	2017	TiO2	no	MAPbI3	one-step	spin	chlorobenzene	DMF+PDMSurea	spiro-OMeTAD	Li+TBP	16.4
Xiao, G. et al., Ceram. Int. 43, 12534–12539 (2017)	2017	TiO2	TiO2	MAPbI3-xBrx	two-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	16.2
Xiao, M. et al., J. Am. Chem. Soc. 139, 3378–3386 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3OT	no	6.9
Xiao, M. et al., J. Am. Chem. Soc. 139, 3378–3386 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3DT	no	6.6
Xiao, M. et al., J. Am. Chem. Soc. 139, 3378–3386 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3DDT	no	3.9
Xiao, M. et al., J. Am. Chem. Soc. 139, 3378–3386 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	9.6
Xiao, Y. et al., J. Power Sources 342, 489–494 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	10.3
Xiao, Y. et al., J. Power Sources 342, 489–494 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	no	no	12.1
Xie, X. et al., Org. Electron. 44, 120–125 (2017)	2017	PCBM	0	MAPbI3	two-step	evap-spin	no	na	spiro-OMeTAD	Li+TBP	7.9

Xie, X. et al., Org. Electron. 44, 120–125 (2017)	2017	PFN ITOkısmına alsak mı	PCBM	MAPbI3	two-step	evap-spin	no	na	spiro-OMeTAD	Li+TBP	12.9
Xu, Z. et al., J. Phys. Chem. C 121, 24389–24396 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	8.5
Yang, G. et al., J. Mater. Chem. A 5, 1658–1666 (2017)	2017	ZnO	0	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	P3HT	no	11.4
Yang, G. et al., J. Mater. Chem. A 5, 1658–1666 (2017)	2017	SnO2	0	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.3
Yang, G. et al., Small 13, 1601769 (2017)	2017	SnO2	0	MAPbI3	one-step	spin 2-3	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.3
Yang, G. et al., Small 13, 1601769 (2017)	2017	SnO2	0	MAPbI3	one-step	spin 2-3	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	13.4
Ye, J. et al., Appl. Surf. Sci. 407, 427–433 (2017)	2017	TiO2	mTiO2	(FAPbI3)0.85 (MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.5
Ye, T. et al., ACS Appl. Mater. Interfaces 9, 2358–2368 (2017)	2017	TiO2	mTiO2	FA0.81MA0.15Pb(I0.836 Br0.15)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	20.6
Ye, T. et al., ACS Appl. Mater. Interfaces 9, 2358–2368 (2017)	2017	TiO2	mTiO2	FA0.81MA0.15Pb(I0.836 Br0.15)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	17.1
Yu, Y. et al., ACS Appl. Mater. Interfaces 9, 23624–	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.4

23634 (2017)											
Yu, Y. et al., ACS Appl. Mater. Interfaces 9, 23624–23634 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	n-hexane	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.7
Yu, M. et al., Phys. Chem. Chem. Phys. 19, 19922–19927 (2017)	2017	TiO2	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	15.8
Yu, M. et al., Phys. Chem. Chem. Phys. 19, 19922–19927 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP+FK 209	15.7
Zhang, T. et al., Sci. Adv. 3, e1700841 (2017)	2017	TiO2	no	CsPbI3□xED AI2	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.7
Zhang, C. et al., Nanoscale 9, 2852–2864 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP+FK 209	15.1
Zhang, C. et al., Nanoscale 9, 2852–2864 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP+FK 209	12
Zhang, C. et al., Nanoscale 9, 2852–2864 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP+FK 209	16
Zhang, C. et al., Nanoscale 9, 2852–2864 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMSO+GBL	spiro-OMeTAD	Li+TBP+FK 209	10.7
Zhang, C. et al., Energy Procedia 105, 793–798 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.5

Zhang, F. et al., Nano Energy 41, 469–475 (2017)	2017	TiO2	mTiO2	(FAI)0.81(PbI2)0.85(MABr)0.15(PbBr2)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Z26	Li+TBP+FK209	20.1
Zhang, F. et al., Nano Energy 41, 469–475 (2017)	2017	TiO2	mTiO2	(FAI)0.81(PbI2)0.85(MABr)0.15(PbBr2)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Z25	Li+TBP+FK209	16.9
Zhang, F. et al., Nano Energy 41, 469–475 (2017)	2017	TiO2	mTiO2	(FAI)0.81(PbI2)0.85(MABr)0.15(PbBr2)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	20.6
Zhang, X. et al., Sol. Energy 148, 70–77 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	11.8
Zhang, X. et al., Sol. Energy 148, 70–77 (2017)	2017	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF+AI	spiro-OMeTAD	Li+TBP	13.6
Zhang, W. et al., ACS Appl. Mater. Interfaces 9, 38467–38476 (2017)	2017	ZnO	0	MAPbI3	two-step	spin-dip	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.5
Zhang, W. et al., ACS Appl. Mater. Interfaces 9, 38467–38476 (2017)	2017	ZnO	PCBM	MAPbI3	two-step	spin-dip	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.1

Zhang, M.-D. et al., Dye. Pigment. 146, 589–595 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	na	SYN1	Li+TBP	13.1
Zhang, M.-D. et al., Dye. Pigment. 146, 589–595 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	na	PARA1	Li+TBP	11.4
Zhang, M.-D. et al., Dye. Pigment. 146, 589–595 (2017)	2017	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	na	spiro-OMeTAD	Li+TBP	12
Zhao, P. et al. J. Mater. Chem. A 5, 7905–7911 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.3
Zhao, P. et al. J. Mater. Chem. A 5, 7905–7911 (2017)	2017	TiO2	mTiO2	MA1-xKxPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.3
Zhao, Y. et al., J. Power Sources 359, 147–156 (2017)	2017	TiO2	mTiO2	FAPbI3	two-step	spin-drip	no	DMF+DMSO	spiro-OMeTAD	no	17.7
Zhao, Y. et al., J. Power Sources 359, 147–156 (2017)	2017	TiO2	mTiO2	FA0.6MA0.4PbI3	two-step	spin-drip	no	DMF+DMSO	spiro-OMeTAD	no	19.3
Zheng, X. et al., Nano Lett. 17, 2496–2505 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	no	no	15.2
Zheng, X. et al., Nano Lett. 17, 2496–2505 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	no	no	14.6
Zheng, X. et al., Nano Lett. 17, 2496–2505 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	no	no	10.7
Zheng, Y.-Z. et al., J. Phys. Chem. Solids 107, 55–61 (2017)	2017	ZnO	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	10.1

Zheng, Y.-Z. et al., J. Phys. Chem. Solids 107, 55–61 (2017)	2017	ZnO	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	6.5
Zheng, Y.-Z. et al., J. Phys. Chem. Solids 107, 55–61 (2017)	2017	ZnO	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	8.9
Zheng, Y.-Z. et al., J. Phys. Chem. Solids 107, 55–61 (2017)	2017	ZnO	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	12.7
Zheng, Y.-Z. et al., J. Phys. Chem. Solids 107, 55–61 (2017)	2017	ZnO	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	11.2
Zheng, Y.-Z. et al., J. Phys. Chem. Solids 107, 55–61 (2017)	2017	ZnO	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	10.9
Zheng, X. et al., Nano Energy 38, 1–11 (2017)	2017	SnO2	PCBM	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.6
Zheng, X. et al., Nano Energy 38, 1–11 (2017)	2017	SnO2	PCBM	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.8
Zheng, L. et al., Energy Procedia 105, 188–193 (2017)	2017	TiO2	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.3
Zheng, L. et al., Energy Procedia 105, 188–193 (2017)	2017	no	no	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.1
Zheng, J. et al., Sol. Energy Mater. Sol. Cells 168, 165–171 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	blowdry	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	17.4
Zheng, J. et al., Sol. Energy Mater. Sol. Cells 168, 165–171 (2017)	2017	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	15.6

Zheng, L. et al., ACS Appl. Mater. Interfaces 9, 14129–14135 (2017)	2017	TiO2	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	14.1
Zheng, L. et al., ACS Appl. Mater. Interfaces 9, 14129–14135 (2017)	2017	PTEBS	0	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	15.4
Zheng, L. et al., ACS Appl. Mater. Interfaces 9, 14129–14135 (2017)	2017	no	no	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	7.8
Zong, X. et al., Tetrahedron 73, 3398–3405 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	Q221	Li+TBP	10.4
Zong, X. et al., Tetrahedron 73, 3398–3405 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	Q222	Li+TBP	8.9
Zong, X. et al.,Tetrahedron 73, 3398–3405 (2017)	2017	TiO2	mTiO2	MAPbI3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	10.1
Zuo, L. et al., Sci. Adv. 3, e1700106 (2017)	2017	SnO2	no	MAPbI3-xClx	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	18
Zuo, L. et al., Sci. Adv. 3, e1700106 (2017)	2017	SnO2	no	MAPbI3-xClx	two-step	spin	no	DMF+PAA	spiro-OMeTAD	Li+TBP	19.6
Zuo, L. et al., Sci. Adv. 3, e1700106 (2017)	2017	SnO2	no	MAPbI3-xClx	two-step	spin	no	DMF+PEI	spiro-OMeTAD	Li+TBP	16.7
Zuo, L. et al., Sci. Adv. 3, e1700106 (2017)	2017	SnO2	no	MAPbI3-xClx	two-step	spin	no	DMF+PVP	spiro-OMeTAD	Li+TBP	20.2

Zuo, L. et al., Nano Lett. 17, 269–275 (2017)	2017	SnO2	0	MAPbI3-xClx	two-step	spin-drip	no	DMF	spiro-OMeTAD	Li+TBP	17.2
Zuo, L. et al., Nano Lett. 17, 269–275 (2017)	2017	SnO2	PA-SAM	MAPbI3-xClx	two-step	spin-drip	no	DMF	spiro-OMeTAD	Li+TBP	18.8
Adnan, M. and Lee, J. K., Sci. Rep. 8, 2168 (2018)	2018	TiO2	mTiO2	MAPbI3	two-step	dipping	no	na	spiro-OMeTAD	Li+TBP	12.4
Amini, M. et al., J. Mater. Chem. A 6, 2632–2642 (2018)	2018	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.1
Amini, M. et al., J. Mater. Chem. A 6, 2632–2642 (2018)	2018	P123-ib	mTiO2	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.7
Bashir, A. et al., Nanoscale 10, 2341–2350 (2018)	2018	TiO2	mTiO2	MAPbI3-5AVAI	one-step	spin	no	GBL	no	no	11.3
Bashir, A. et al., Nanoscale 10, 2341–2350 (2018)	2018	TiO2	mTiO2	MAPbI3-5AVAI	one-step	spin	no	GBL	no	no	9.3
Bashir, A. et al., Nanoscale 10, 2341–2350 (2018)	2018	TiO2	mTiO2	MAPbI3-5AVAI	one-step	spin	no	GBL	Co3O4	no	13.3
Bashir, A. et al., Nanoscale 10, 2341–2350 (2018)	2018	TiO2	mTiO2	MAPbI3-5AVAI	one-step	spin	no	GBL	Co3O4	no	11.7
Chen, T.-P. et al., Adv. Energy Mater. 8, 1701722 (2018)	2018	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.3
Chen, T.-P. et al., Adv. Energy Mater. 8, 1701722 (2018)	2018	2D titania	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.2

Chen, T.-P. et al., Adv. Energy Mater. 8, 1701722 (2018)	2018	no	no	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	7.2
Chen, R. et al., Energy Fuels 2, 1093–1100 (2018)	2018	TiO2	0	MAPb1-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.2
Chen, R. et al., Energy Fuels 2,1093–1100 (2018)	2018	TiO2	0	MAPb1-xZnxI3-yCly	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.9
Christians, J. A. et al., Nat. Energy 3, 68–74 (2018)	2018	TiO2	mTiO2	(FA0.76MA0.21Cs0.03)0.67Pb(I0.89Br0.11)2.56	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.6
Christians, J. A. et al., Nat. Energy 3, 68–74 (2018)	2018	TiO2	mTiO2	(FA0.76MA0.21Cs0.03)0.67Pb(I0.89Br0.11)2.56	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	14.4
Christians, J. A. et al., Nat. Energy 3, 68–74 (2018)	2018	SnO2	mTiO2	(FA0.76MA0.21Cs0.03)0.67Pb(I0.89Br0.11)2.56	one-step	spin 2-3	chlorobenzene	DMF+DMSO	EH44	EH44-ox+TBP	12.3
Christians, J. A. et al., Nat. Energy 3, 68–74 (2018)	2018	TiO2	mTiO2	(FA0.76MA0.	one-step	spin 2-3	chlorobenzene	DMF+DMSO	EH44	EH44-ox+TBP	16.8

				21Cs0.03)0.67Pb(I0.89Br 0.11)2.56							
Deng, X. et al., Superlattices Microstruct. 117, 283–287 (2018)	2018	TiO2	TiO2	MAPbI3-xBrx	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	18.1
Deng, X. et al., Superlattices Microstruct. 117, 283–287 (2018)	2018	TiO2	TiO2	MAPbI3-xBrx	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	16.4
Domanski, K. et al., Nat. Energy 3, 61–67 (2018)	2018	TiO2	mTiO2	Cs5(FA83MA17)95Pb(I83Br17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	20.2
Draguta, S. et al. Energy Environ. Sci. 11, 960–969 (2018)	2018	TiO2	0	FAI, PbI2, MABr, PbBr2,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	18.8
Draguta, S. et al. Energy Environ. Sci. 11, 960–969 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	17.8
Gomez, A. et al., Nano Energy 45, 94–100 (2018)	2018	TiO2	mTiO2	FAI, PbI2, MABr, PbBr2, CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	17.3
Guo, Y. et al., ACS Appl. Energy Mater. acsaem.8b00094 (2018). doi:10.1021/acsaem. 8b00094	2018	IL/PCB M	Nb2O5	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	18.8
Guo, Y. et al., ACS Appl. Energy Mater. acsaem.8b00094 (2018). doi:10.1021/acsaem. 8b00094	2018	IL	Nb2O5	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.4

Guo, Y. et al., ACS Appl. Energy Mater. acsaem.8b00094 (2018). doi:10.1021/acsaem. 8b00094	2018	PCBM	Nb2O5	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.6
Guo, Y. et al., Sol. Energy Mater. Sol. Cells 178, 186–192 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	12.7
Guo, Y. et al., Sol. Energy Mater. Sol. Cells 178, 186–192 (2018)	2018	TiO2	CdS	MAPbI3	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16
Hou, Q. et al., ChemElectroChem 5, 725 (2018)	2018	α-Fe2O3	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	12.1
Hou, Q. et al., ChemElectroChem 5, 725 (2018)	2018	α-Fe2O3	PCBM	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	Li+TBP	14.2
Jiang, H. et al., ACS Appl. Energy Mater. 1, 900–909 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	no	DMSO+GBL	spiro-OMeTAD	Li+TBP	16.9
Jiang, H. et al., ACS Appl. Energy Mater. 1, 900–909 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	no	DMSO+GBL+ HaHc	spiro-OMeTAD	Li+TBP	18.7
Kogo, A. et al., ACS Appl. Mater. Interfaces 10, 2224– 2229 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	13.2
Kogo, A. et al., ACS Appl. Mater. Interfaces 10, 2224– 2229 (2018)	2018	0	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	13
Kogo, A. et al., ACS Appl. Mater. Interfaces 10, 2224– 2229 (2018)	2018	SnO2	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	18.6

Kogo, A. et al., ACS Appl. Mater. Interfaces 10, 2224–2229 (2018)	2018	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	20.2
Li, F. et al., Adv. Funct. Mater. 28, 1706377 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMSO+GBL	spiro-OMeTAD	no	17.7
Li, F. et al., Adv. Funct. Mater. 28, 1706377 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	chlorobenzene +PF1	DMSO+GBL	spiro-OMeTAD	no	18.7
Li, F. et al., Adv. Funct. Mater. 28, 1706377 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	chlorobenzene +F+N2200	DMSO+GBL	spiro-OMeTAD	no	18.4
Li, F. et al., Adv. Funct. Mater. 28, 1706377 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	chlorobenzene +PF0	DMSO+GBL	spiro-OMeTAD	no	18.1
Li, F. et al., Adv. Funct. Mater. 28, 1706377 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	chlorobenzene +N2200	DMSO+GBL	spiro-OMeTAD	no	17.9
Li, K. et al., Sci. Rep. 8, 442 (2018)	2018	C60	0	MAPbI3	two-step	evap-spin	no	na	spiro-OMeTAD	Li+TBP	15
Li, B. et al., Nat. Commun. 9, 1076-2018	2018	TiO2	mTiO2	CsPbI3	one-step	spin	no	DMF+DMSO +PVP	spiro-OMeTAD	no	10.7
Li, B. et al., Nat. Commun. 9, 1076 (2018)	2018	TiO2	mTiO2	CsPbI2Br	one-step	spin	no	DMF+DMSO +PVP	spiro-OMeTAD	no	8
Liu, N. et al., J. Mater. Chem. A 6, 6806–6814 (2018)	2018	SnO2	0	MAxFA1-xPbI3-yBry	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.6
Liu, N. et al., J. Mater. Chem. A 6, 6806–6814 (2018)	2018	SnO2	0	MAxFA1-xPbI3-yBry	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.5

Magomedov, A. et al., Adv. Funct. Mater. 28, 1704351 (2018)	2018	TiO2	mTiO2	Cs0.1(MA0.15FA0.85)0.9Pb(I0.85Br0.15)	one-step	spin	trifluorotoluene	DMF+DMSO	V885	Li+TBP+FK209	18.9
Magomedov, A. et al., Adv. Funct. Mater. 28, 1704351 (2018)	2018	TiO2	mTiO2	Cs0.1(MA0.15FA0.85)0.9Pb(I0.85Br0.15)	one-step	spin	trifluorotoluene	DMF+DMSO	V911	Li+TBP+FK209	18.9
Magomedov, A. et al., Adv. Funct. Mater. 28, 1704351 (2018)	2018	TiO2	mTiO2	Cs0.1(MA0.15FA0.85)0.9Pb(I0.85Br0.15)	one-step	spin	trifluorotoluene	DMF+DMSO	V886	Li+TBP+FK209	18.5
Magomedov, A. et al., Adv. Funct. Mater. 28, 1704351 (2018)	2018	TiO2	mTiO2	Cs0.1(MA0.15FA0.85)0.9Pb(I0.85Br0.15)	one-step	spin	trifluorotoluene	DMF+DMSO	V1no39	Li+TBP+FK209	17.4
Magomedov, A. et al., Adv. Funct. Mater. 28, 1704351 (2018)	2018	TiO2	mTiO2	Cs0.1(MA0.15FA0.85)0.9Pb(I0.85Br0.15)	one-step	spin	trifluorotoluene	DMF+DMSO	V946	Li+TBP+FK209	17.1
Magomedov, A. et al., Adv. Funct. Mater. 28, 1704351 (2018)	2018	TiO2	mTiO2	Cs0.1(MA0.15FA0.85)0.9Pb(I0.85Br0.15)	one-step	spin	trifluorotoluene	DMF+DMSO	V957	Li+TBP+FK209	17.1
Magomedov, A. et al., Adv. Funct. Mater. 28, 1704351 (2018)	2018	TiO2	mTiO2	Cs0.1(MA0.15FA0.85)0.9Pb(I0.85Br0.	one-step	spin	trifluorotoluene	DMF+DMSO	V928	Li+TBP+FK209	16.5

				15)							
Magomedov, A. et al., Adv. Funct. Mater. 28, 1704351 (2018)	2018	TiO2	mTiO2	Cs0.1(MA0.15FA0.85)0.9Pb(I0.85Br0.15)	one-step	spin	trifluorotoluene	DMF+DMSO	V9no8	Li+TBP+FK209	16.5
Magomedov, A. et al., Adv. Funct. Mater. 28, 1704351 (2018)	2018	TiO2	mTiO2	Cs0.1(MA0.15FA0.85)0.9Pb(I0.85Br0.15)	one-step	spin	trifluorotoluene	DMF+DMSO	V931	Li+TBP+FK209	16.3
Mathies, F. et al., ACS Appl. Energy Mater. acsaem.8b00222 (2018). doi:10.1021/acsaem. 8b00222	2018	TiO2	0	Cs0.1(FA0.83MA0.17)0.9Pb(Br0.17I0.83)3	one-step	printed	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.3
Ng, C. H. et al., Sci. Rep. 8, 2482 (2018)	2018	TiO2	mTiO2	CsPbBr3	two-step	spin-dip	no	DMF	P3HT	no	3.1
Ng, C. H. et al., Sci. Rep. 8, 2482 (2018)	2018	TiO2	mTiO2	CsPbBr2.9I0.1	two-step	spin-dip	no	DMF	P3HT	no	2.5
Ng, C. H. et al., Sci. Rep. 8, 2482 (2018)	2018	TiO2	mTiO2	CsPbBr2.9I0.1	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	4
Ng, C. H. et al., Sci. Rep. 8, 2482 (2018)	2018	TiO2	mTiO2	CsPbBr3	two-step	spin-dip	no	DMF	spiro-OMeTAD	Li+TBP	3
Nimens, W. J. et al., ACS Appl. Energy Mater. 1, acsaem.7b00147 (2018)	2018	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	PTAA	Li+TBP	13.5

Nimens, W. J. et al., ACS Appl. Energy Mater. 1, acsaem.7b00147 (2018)	2018	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	PTAA	Li+TBP	6.3
Nimens, W. J. et al., ACS Appl. Energy Mater. 1, acsaem.7b00147 (2018)	2018	0	mTiO2	MAPbI3-xClx	one-step	spin	no	DMF	PTAA	Li+TBP	7.7
Suk, K., Thin Solid Films (2018). doi:10.1016/j.tsf.2018 .04.017	2018	ZnO	0	FAPbI3-MAPbBr3	one-step	spin 2-3	toluene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	14.9
Suk, K., Thin Solid Films (2018). doi:10.1016/j.tsf.2018 .04.017	2018	ZnO	0	FAPbI3-MAPbBr3	one-step	spin 2-3	toluene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	13.7
Pelicano, C. M. and Yanagi, H., J. Energy Chem. 27, 455–462 (2018)	2018	ZnO	ZnO-nanorod	MAPbI3	one-step	spin	toluene	DMF	P3HT	no	4.9
Pelicano, C. M. and Yanagi, H., J. Energy Chem. 27, 455–462 (2018)	2018	ZnO	ZnO-nanorod	MAPbI3	one-step	spin	toluene	DMF	P3HT	no	3.4
Que, M. et al., J. Power Sources 383, 42–49 (2018)	2018	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15
Que, M. et al., J. Power Sources 383, 42–49 (2018)	2018	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.9
Raminafshar, C. et al., Electrochim. Acta 276, 261–267 (2018)	2018	TiO2	mZrO2	(5-AVA) x (MA) 1-xPbI3	one-step	drip	no	GBL	no	no	10.7
Shao, F. et al., Sci. Rep. 8, 7033 (2018)	2018	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	trifluorotoluene	DMSO	spiro-OMeTAD	Li+TBP+FK 209	16.4

Shao, F. et al., Sci. Rep. 8, 7033 (2018)	2018	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	trifluorotoluene	DMSO	spiro-OMeTAD	Li+TBP+FK209	8.3
Son, D.-Y. et al., J. Am. Chem. Soc. 140, jacs.7b10430 (2018)	2018	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.5
Son, D.-Y. et al., J. Am. Chem. Soc. 140,jacs.7b10430 (2018)	2018	TiO2	mTiO2	FAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	14.8
Son, D.-Y. et al., J. Am. Chem. Soc. 140, jacs.7b10430 (2018)	2018	TiO2	mTiO2	FA0.85MA0.1Cs0.05PbI2.7Br0.3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.6
Son, D.-Y. et al., J. Am. Chem. Soc. 140, jacs.7b10430 (2018)	2018	TiO2	mTiO2	FA0.85MA0.15PbI2.55Br0.45	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.8
Son, D.-Y. et al., J. Am. Chem. Soc. 140, jacs.7b10430 (2018)	2018	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO+KI	spiro-OMeTAD	Li+TBP	17.2
Son, D.-Y. et al., J. Am. Chem. Soc. 140, jacs.7b10430 (2018)	2018	TiO2	mTiO2	FAPbI3	one-step	spin	diethyl ether	DMF+DMSO+KI	spiro-OMeTAD	Li+TBP	10.7
Son, D.-Y. et al., J. Am. Chem. Soc. 140, jacs.7b10430 (2018)	2018	TiO2	mTiO2	FA0.85MA0.1Cs0.05PbI2.7Br0.3	one-step	spin	diethyl ether	DMF+DMSO+KI	spiro-OMeTAD	Li+TBP	18.8
Son, D.-Y. et al., J. Am. Chem. Soc. 140, jacs.7b10430 (2018)	2018	TiO2	mTiO2	FA0.85MA0.15PbI2.55Br0.45	one-step	spin	diethyl ether	DMF+DMSO+KI	spiro-OMeTAD	Li+TBP	17.9
Sun, K. et al., ACS Appl. Energy Mater. acsaem.8b00160 (2018). doi:10.1021/acsaem. 8b00160	2018	TiO2	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	18.5

Sun, K. et al., ACS Appl. Energy Mater. acsaem.8b00160 (2018). doi:10.1021/acsaem. 8b00160	2018	TiO2	0	MAPbI3	two-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	14.3
Wang, Q., J. Phys. Chem. C 122, 4822–4827 (2018)	2018	TiO2	0	MAPbI2.85Br 0.15	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.8
Wang, Q., J. Phys. Chem. C 122, 4822–4827 (2018)	2018	TiO2	mTiO2	MAPbI2.85Br 0.15	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	6.5
Wang, B. et al., Journal of Energy Chemistry 27, 736–741 (2017)	2018	TiO2	mTiO2	MAPbI3	one-step	spin	ethylacetate	DMF+DMSO	spiro-OMeTAD	no	16.6
Xu, Z. et al., J. Mater. Chem. C 6, 4746–4752 (2018)	2018	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	13.4
Xu, Z. et al., J. Mater. Chem. C 6, 4746–4752 (2018)	2018	TiO2	0	MAPbI3-xClx	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.7
Ye, Q.-Q. et al., ACS Energy Lett. 3, 875–882 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	no	16.3
Ye, Q.-Q. et al., ACS Energy Lett. 3, 875–882 (2018)	2018	TiO2	bis-PCBM-DMC	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	no	20.1
Ye, Q.-Q. et al., ACS Energy Lett. 3, 875–882 (2018)	2018	TiO2	bis-PCBM	MAPbI3	one-step	spin	chlorobenzene	DMF	spiro-OMeTAD	no	17.8
Zhang, M. et al., Sol. RRL 2, 1700213 (2018)	2018	TiO2	0	FAI, CsI, PbI2, MABr,PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	19.1

Zhang, M. et al., Sol. RRL 2, 1700213 (2018)	2018	TiO2	0	FAI, CsI, PbI2, MABr,PbBr2	one-step	spin 2-3	methoxybenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	19.4
Zhang, R. et al., Electrochim. Acta 265, 98–106 (2018)	2018	TiO2	mTiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.2
Zhang, R. et al., Electrochim. Acta 265, 98–106 (2018)	2018	TiO2	mTiO2	CsI, FAI, PbI2, MABr, PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	18.2
Zhao, X. et al., Nano Lett. 18, 2442–2449 (2018)	2018	SnO2	0	FA0.75MA0.15Cs0.1PbI2.65Br0.35	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.2
Zhao, X. et al., Nano Lett. 18, 2442–2449 (2018)	2018	SnO2	0	FA0.75MA0.15Cs0.1PbI2.65Br0.35	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19
Zhao, X. et al., Nano Lett. 18, 2442–2449 (2018)	2018	SnO2	0	FA0.75MA0.15Cs0.1PbI2.65Br0.35	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.8
Zhao, X. et al., Nano Lett. 18, 2442–2449 (2018)	2018	SnO2	0	FA0.83MA0.17PbI2.63Br0.37	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.2
Zhao, X. et al., Nano Lett. 18, 2442–2449 (2018)	2018	NDI-graphene	0	FA0.83MA0.17PbI2.63Br0.37	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	9.8
Zhao, Y. et al., Nat. Commun. 9, 1607 (2018)	2018	TiO2	0	Cs10 (Cs0.1FA0.78MA0.12PbI2.55Br0.45)	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	21.7

Ng, C. H. et al., Sci. Rep. 8, 2482 (2018)	2018	TiO2	0	PbI2/FAI/MA Br/MACl	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.4
Zhu, W. et al., Dalt. Trans. 47, 6404–6411 (2018)	2018	TiO2	0	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	17.9
Thermodynamically stabilized b-CsPbI3–based perovskite solar cells with efficiencies >18%	2019	TiO2	no	CsPbI3	one-step	spin	no	DMF	spiro-OMeTAD	no	18.4
Surface passivation of perovskite film for efficient solar cells	2019	SnO2	no	FA-MA	two-step	spin	no	DMF+DMSO +others	spiro-OMeTAD	Li+TBP	23.32
Perovskite-polymer composite cross-linker approach for highly-stable and efficient perovskite solar cells approach for highly-stable and efficient perovskite solar cells	2019	SnO2	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.97
Perovskite-polymer composite cross-linker approach for highly-stable and efficient perovskite solar cells approach for highly-stable and efficient perovskite solar cells	2019	SnO2	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.65
Perovskite-polymer composite cross-linker approach for highly-stable and efficient perovskite solar cells approach for highly-stable and efficient perovskite	2019	SnO2	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.09

solar cells											
Perovskite-polymer composite cross-linker approach for highly-stable and efficient perovskite solar cells approach for highly-stable and efficient perovskite solar cells	2019	SnO2	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.35
Single-Crystal MAPbI3 Perovskite Solar Cells Exceeding 21% Power Conversion Efficiency	2019	PTAA	C60	MAPbI3	one-step	spin	no	no	PTAA	no	21.09
Efficient, stable and scalable perovskite solar cells using poly(3-hexylthiophene)	2019	TiO2	TiO2	FA-MA	one-step	spin	diethyl ether	DMF+DMSO	P3HT	no	22.67
Planar p–n homojunction perovskite solar cells with efficiency exceeding 21.3%	2019	TiO2	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.27
Planar p–n homojunction perovskite solar cells with efficiency exceeding 21.3%	2019	TiO2	no	FA-MA	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	21.23
Performance of perovskite solar cells under simulated temperature-illumination real-world operating conditions	2019	TiO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	19.5
Ultrahydrophobic 3D/2D fluoroarene bilayer-based water-resistant perovskite solar cells with efficiencies exceeding 22%	2019	TiO2	TiO2	others	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	19.74
Methylammonium Chloride Induces Intermediate Phase Stabilization for Efficient Perovskite Solar Cells	2019	TiO2	TiO2	FA-MA	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP+TFSI	24.02

Strain engineering in perovskite solar cells and its impacts on carrier dynamics	2019	SnO2	no	Cs-FA-MA	one-step	spin	toluene	DMF+DMSO	spiro-OMeTAD	Li+TBP+TFSI	20.7
Temperature Impact on Perovskite Solar Cells Under Operation	2019	TiO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	11.4
Impedance analysis of perovskite solar cells: a case study	2019	TiO2	TiO2	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP+TFSI	16.25
Impedance analysis of perovskite solar cells: a case study	2019	TiO2	TiO2	CsPbI3	two-step	spin	no	DMF+others	spiro-OMeTAD	Li+TBP	4.5
Record Open-Circuit Voltage Wide-Bandgap Perovskite Solar Cells Utilizing 2D/3D Perovskite Heterostructure	2019	SnO2	no	Cs-FA-MA	two-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.4
Structurally Reconstructed CsPbI2Br Perovskite for Highly Stable and Square-Centimeter All-Inorganic Perovskite Solar Cells	2019	ZnO	C60	CsPbI3	two-step	spin	no	DMSO	others	no	10.4
CsPbBr3 perovskite nanoparticles as additive for environmentally stable perovskite solar cells with 20.46% efficiency	2019	TiO2	TiO2	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.46
Precise Control of Crystal Growth for Highly Efficient CsPbI2Br Perovskite Solar Cells	2019	TiO2	no	CsPbI3	one-step	spin	IPA	DMSO	spiro-OMeTAD	Li+TBP	15.75
Dual Interfacial Design for Efficient CsPbI2Br Perovskite Solar Cells with Improved Photostability	2019	SnO2	others	CsPbI3	two-step	spin	no	DMF+DMSO	others	no	16.2
Dual Interfacial Design for Efficient CsPbI2Br Perovskite Solar Cells with Improved	2019	SnO2	others	CsPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	15.1

Photostability											
Dual Interfacial Design for Efficient CsPbI2Br Perovskite Solar Cells with Improved Photostability	2019	SnO2	no	CsPbI3	two-step	spin	no	DMF+DMSO	others	no	13
Dual Interfacial Design for Efficient CsPbI2Br Perovskite Solar Cells with Improved Photostability	2019	SnO2	no	CsPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	12.3
Planar perovskite solar cells with long-term stability using ionic liquid additives	2019	NiOx	no	Cs-FA-MA	one-step	spin	anisole	others	PCBM	others	19.8
Planar perovskite solar cells with long-term stability using ionic liquid additives	2019	NiOx	no	Cs-FA-MA	one-step	spin	anisole	DMF+DMSO +others	PCBM	others	18.5
Role of GeI2 and SnF2 additives for SnGe perovskite solar cells	2019	PCBM	no	Cs-FA-MA	one-step	spin	no	DMF+DMSO	PEDOT:PSS	others	7.9
Highly Efficient Semitransparent Perovskite Solar Cells for Four Terminal Perovskite-Silicon Tandems	2019	SnO2	no	Cs-FA	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP+FK 209	17.2
Highly Efficient Semitransparent Perovskite Solar Cells for Four Terminal Perovskite-Silicon Tandems	2019	TiO2	no	Cs-FA-MA	one-step	spin	no	no	spiro-OMeTAD	Li+TBP+FK 209	16.8
Highly Efficient Semitransparent Perovskite Solar Cells for Four Terminal Perovskite-Silicon Tandems	2019	SnO2	no	Cs-FA-MA	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP+FK 209	13.7
Highly Efficient Semitransparent Perovskite Solar Cells for Four Terminal Perovskite-Silicon Tandems	2019	TiO2	no	Cs-FA	one-step	spin	no	no	spiro-OMeTAD	Li+TBP+FK 209	14.3

Highly Stable and Efficient FASnI3-Based Perovskite Solar Cells by Introducing Hydrogen Bonding	2019	BCP	C60	FASnI3	one-step	spin	chlorobenzene	DMSO	PEDOT:PSS	no	6.4
Highly Stable and Efficient FASnI3-Based Perovskite Solar Cells by Introducing Hydrogen Bonding	2019	BCP	C60	FASnI3	one-step	spin	chlorobenzene	DMSO	PEDOT:PSS	no	6.4
Self-Assembled 2D Perovskite Layers for Efficient Printable Solar Cells	2019	PEDOT:PSS	no	others	one-step	others	no	DMF	PCBM	others	14.5
Self-Assembled 2D Perovskite Layers for Efficient Printable Solar Cells	2019	PEDOT:PSS	no	others	one-step	others	no	DMF	PCBM	others	12.5
Self-Assembled 2D Perovskite Layers for Efficient Printable Solar Cells	2019	PEDOT:PSS	no	others	one-step	others	no	DMF	PCBM	others	8
Pb-Reduced CsPb0.9Zn0.1I2Br Thin Films for Efficient Perovskite Solar Cells	2019	c-TiO2	no	CsPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	13.6
Pb-Reduced CsPb0.9Zn0.1I2Br Thin Films for Efficient Perovskite Solar Cells	2019	c-TiO2	no	CsPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	11.8
Robust Tin-based Perovskite Solar cells with Hybrid Organic Cations to Attain Efficiency Approaching 10%	2019	BCP	C60	FASnI3	one-step	spin	chlorobenzene	DMSO	PEDOT:PSS	no	7.4
Cation influence on carrier dynamics in perovskite solar cells	2019	TiO2	TiO2	FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	16.5
Cation influence on carrier dynamics in perovskite solar cells	2019	TiO2	TiO2	FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.1

Cation influence on carrier dynamics in perovskite solar cells	2019	TiO2	TiO2	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.9
Cation influence on carrier dynamics in perovskite solar cells	2019	TiO2	TiO2	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.1
Bilateral alkylamine for suppressing charge recombination and improving stability in blade-coated perovskite solar cells	2019	TiO2	TiO2	Cs-FA-MA	one-step	spin-drip	no	DMF	PTAA	no	15.02
Bilateral alkylamine for suppressing charge recombination and improving stability in blade-coated perovskite solar cells	2019	BCP	C60	Cs-FA-MA	one-step	spin-drip	no	DMF	PTAA	no	20.36
Bilateral alkylamine for suppressing charge recombination and improving stability in blade-coated perovskite solar cells	2019	BCP	C60	MAPbI3	one-step	spin-drip	no	DMF	PTAA	no	16.45
Bilateral alkylamine for suppressing charge recombination and improving stability in blade-coated perovskite solar cells	2019	BCP	C60	MAPbI3	one-step	spin-drip	no	DMF	PTAA	no	20.53
Bilateral alkylamine for suppressing charge recombination and improving stability in blade-coated perovskite solar cells	2019	BCP	C60	Cs-FA	one-step	spin-drip	no	DMF	PTAA	no	11.78
Bilateral alkylamine for suppressing charge recombination and improving stability in blade-coated perovskite solar cells	2019	BCP	C60	Cs-FA	one-step	spin-drip	no	DMF	PTAA	no	13.87
Targeted Therapy for Interfacial Engineering Toward Stable and Efficient Perovskite Solar Cells	2019	others	PCBM	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	PTAA	no	21.8

Targeted Therapy for Interfacial Engineering Toward Stable and Efficient Perovskite Solar Cells	2019	others	no	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	PTAA	no	18.61
Caffeine Improves the Performance and Thermal Stability of Perovskite Solar Cells	2019	SnO2	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	PTAA	no	16.92
Caffeine Improves the Performance and Thermal Stability of Perovskite Solar Cells	2019	SnO2	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	PTAA	no	17.74
Caffeine Improves the Performance and Thermal Stability of Perovskite Solar Cells	2019	SnO2	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	PTAA	no	19.87
Caffeine Improves the Performance and Thermal Stability of Perovskite Solar Cells	2019	SnO2	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	PTAA	no	18.4
Self-Seeding Growth for Perovskite Solar Cells with Enhanced Stability	2019	TiO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.76
Controlling competing photochemical reactions stabilizes perovskite solar cells	2019	SnO2	C60	MAPbI3	one-step	spin	toluene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.05
Highly Efficient and Stable Perovskite Solar Cells via Modification of Energy Levels at the Perovskite/Carbon Electrode Interface	2019	TiO2	TiO2	Cs-FA	one-step	spin	IPA	DMF+DMSO	Without HTL	no	10.1
Rapid Crystallization for Efficient 2D Ruddlesden–Popper (2DRP) Perovskite Solar Cells	2019	PEDOT:PSS	no	MAPbI3	one-step	others	no	DMF	PCBM	others	7.33
Rapid Crystallization for Efficient 2D Ruddlesden–Popper (2DRP) Perovskite Solar Cells	2019	PEDOT:PSS	no	MAPbI3	one-step	others	no	DMSO	PCBM	others	8.13

Rapid Crystallization for Efficient 2D Ruddlesden–Popper (2DRP) Perovskite Solar Cells	2019	PEDOT:PSS	no	MAPbI3	one-step	others	no	DMAC	PCBM	others	12.15
Unveiling the operation mechanism of layered perovskite solar cells	2019	PCBM	no	MAPbI3	one-step	spin	no	DMF	PTAA	no	12.7
Impacts of alkaline on the defects property and crystallization kinetics in perovskite solar cells	2019	SnO2	no	Cs-FA-MA	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	21.01
Impacts of alkaline on the defects property and crystallization kinetics in perovskite solar cells	2019	SnO2	no	Cs-FA-MA	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.97
Mechanism of PbI2 In Situ Passivated Perovskite Films for Enhancing Performance of Perovskite Solar Cells	2019	SnO2	no	FA-MA	one-step	spin	IPA	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.61
Mixed-cation perovskite solar cells in space	2019	TiO2	no	Cs-FA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	6.41
Mixed-cation perovskite solar cells in space	2019	TiO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	6.28
Interface-Modification-Induced Gradient Energy Band for Highly Efficient CsPbIBr2 Perovskite Solar Cells	2019	TiO2	no	CsPbI2Br	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	8.37
Mechanism of PbI2 In Situ Passivated Perovskite Films for Enhancing Performance of Perovskite Solar Cells	2019	SnO2	no	FA-MA	two-step	spin	IPA	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.61
Perovskite Cluster-Containing Solution for Scalable D-Bar Coating toward	2019	SnO2	no	MAPbI3	one-step	others	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	17.01

HighThroughput Perovskite Solar Cells											
Europium-Doped CsPbI2Br for Stable and Highly Efficient Inorganic Perovskite Solar Cells	2019	TiO2	TiO2	CsPbI3	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP+FK 209	10.21
Europium-Doped CsPbI2Br for Stable and Highly Efficient Inorganic Perovskite Solar Cells	2019	TiO2	TiO2	CsPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	12.37
Europium-Doped CsPbI2Br for Stable and Highly Efficient Inorganic Perovskite Solar Cells	2019	TiO2	TiO2	CsPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	13.18
Europium-Doped CsPbI2Br for Stable and Highly Efficient Inorganic Perovskite Solar Cells	2019	TiO2	TiO2	CsPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	13.71
Europium-Doped CsPbI2Br for Stable and Highly Efficient Inorganic Perovskite Solar Cells	2019	TiO2	TiO2	CsPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	12.45
Europium-Doped CsPbI2Br for Stable and Highly Efficient Inorganic Perovskite Solar Cells	2019	TiO2	TiO2	CsPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	10.97
Controllable Perovskite Crystallization via Antisolvent Technique Using Chloride Additives for Highly Efficient Planar Perovskite Solar Cells	2019	SnO2	no	FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	19.7
Controllable Perovskite Crystallization via Antisolvent Technique Using Chloride Additives for Highly Efficient Planar Perovskite	2019	SnO2	no	FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	18.65

Solar Cells											
Quantifying the Interface Defect for the Stability Origin of Perovskite Solar Cells	2019	TiO2	no	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	no	17.9
Quantifying the Interface Defect for the Stability Origin of Perovskite Solar Cells	2019	TiO2	PCBA	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	no	20.1
Quantifying the Interface Defect for the Stability Origin of Perovskite Solar Cells	2019	no	no	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	no	13.2
Quantifying the Interface Defect for the Stability Origin of Perovskite Solar Cells	2019	TiO2	no	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	Without HTL	no	3.2
Quantifying the Interface Defect for the Stability Origin of Perovskite Solar Cells	2019	TiO2	no	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	Without HTL	no	7.4
Tailoring Passivation Molecular Structures for Extremely Small Open-Circuit Voltage Loss in Perovskite Solar Cells	2019	BCP	C60	Cs-FA-MA	one-step	spin	no	DMF+DMSO	PTAA	no	21.4
High-Performance Flexible Perovskite Solar Cells via Precise Control of Electron Transport Layer	2019	SnO2	no	Cs-FA-MA	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.5
Interfacial Residual Stress Relaxation in Perovskite Solar Cells with Improved Stability	2019	SnO2	no	FA-MA	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.406
Efficient and Stable Inverted Perovskite Solar Cells Incorporating Secondary Amines	2019	BCP	C60	MAPbI3	one-step	spin	toluene	DMF+DMSO	others	no	18.2
Efficient and Stable Inverted Perovskite Solar Cells Incorporating Secondary Amines	2019	BCP	C60	FA-MA	one-step	spin	toluene	DMF+DMSO	others	no	18.6

Efficient and Stable Inverted Perovskite Solar Cells Incorporating Secondary Amines	2019	BCP	C60	FA-MA	one-step	spin	toluene	DMF+DMSO	others	no	20.9
Efficient and Stable Inverted Perovskite Solar Cells Incorporating Secondary Amines	2019	BCP	C60	FA-MA	one-step	spin	toluene	DMF+DMSO	others	no	21.2
Efficient and Stable Inverted Perovskite Solar Cells Incorporating Secondary Amines	2019	BCP	C60	FA-MA	one-step	spin	toluene	DMF+DMSO	others	no	21.6
Efficient and Stable Inverted Perovskite Solar Cells Incorporating Secondary Amines	2019	BCP	C60	FA-MA	one-step	spin	toluene	DMF+DMSO	others	no	19.7
A new polytriarylamine derivative for dopant-free high-efficiency perovskite solar cells	2019	SnO2	PCBM	MAPbI3	one-step	spin	no	DMF+DMSO	PTAA	no	17
A new polytriarylamine derivative for dopant-free high-efficiency perovskite solar cells	2019	SnO2	PCBM	Cs-FA	one-step	spin	no	DMF+DMSO	PTAA	no	16
Efficient perovskite solar cells by hybrid perovskites incorporated with heterovalent neodymium cations	2019	PEDOT:PSS	no	MAPbI3	two-step	spin	no	DMF+DMSO	PC61BM	no	17.12
Energy Alignment and Recombination in Perovskite Solar Cells: Weighted Influence on the Open Circuit Voltage	2019	TiO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.4
Energy Alignment and Recombination in Perovskite Solar Cells: Weighted Influence on the Open Circuit Voltage	2019	TiO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	others	Li+TBP	14.3
Energy Alignment and Recombination in Perovskite Solar Cells: Weighted Influence on the Open Circuit Voltage	2019	TiO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	others	Li+TBP	15.3

Energy Alignment and Recombination in Perovskite Solar Cells: Weighted Influence on the Open Circuit Voltage	2019	TiO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	others	Li+TBP	16.5
Solution-Phase Epitaxial Growth of Perovskite Films on 2D Material Flakes for High-Performance Solar Cells	2019	PCBM	no	MAPbI3	one-step	spin	diethyl ether	DMF+DMSO	PTAA	no	17.55
Pb-Reduced CsPb0.9Zn0.1I2Br Thin Films for Efficient Perovskite Solar Cells	2019	TiO2	no	CsPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	13.6
Atomic-level passivation mechanism of ammonium salts enabling highly efficient perovskite solar cells	2019	TiO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.5
Ultrahigh Durability Perovskite Solar Cells	2019	TiO2	TiO2	MAPbI3	one-step	spin	toluene	DMSO+GBL	spiro-OMeTAD	no	18.7
Dion−Jacobson Two-Dimensional Perovskite Solar Cells Based on Benzene Dimethanammonium Cation	2019	TiO2	TiO2	others	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.6
A Novel Anion Doping for Stable CsPbI2Br Perovskite Solar Cells with an Efficiency of 15.56% and an Open Circuit Voltage of 1.30 V	2019	TiO2	no	CsPbI3	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	15.56
Highly stable semi-transparent MAPbI3 perovskite solar cells with operational output for 4000 h	2019	PCBM	no	MAPbI3	two-step	spin	no	DMF	PTAA	no	12.5
Interfacial Engineering at the 2D/3D Heterojunction for HighPerformance Perovskite Solar Cells	2019	TiO2	no	FAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.02

Role of GeI2 and SnF2 additives for SnGe perovskite solar cells	2019	PCBM	C60	FA-MA	one-step	spin	toluene	DMF+DMSO	PEDOT:PSS	no	7.9
A Scalable Methylamine Gas Healing Strategy for High Efficiency Inorganic Perovskite Solar Cells	2019	TiO2	TiO2	CsPbI3	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	13.1
Consistent Device Simulation Model Describing Perovskite Solar Cells in Steady-State, Transient, and Frequency Domain	2019	C60	no	MAPbI3	one-step	SVD	no	no	others	no	10
An optimized perovskite solar cell designs for high conversion efficiency	2019	TiO2	no	CH3NH3PbI3	one-step	spin	no	no	spiro-OMeTAD	Li+TBP	18.16
An optimized perovskite solar cell designs for high conversion efficiency	2019	TiO2	no	CH3NH3SnI3	one-step	spin	no	no	spiro-OMeTAD	Li+TBP	9.56
Origin of apparent light-enhanced and negative capacitance in perovskite solar cells	2019	TiO2	TiO2	Cs-FA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19
Reconfiguration of interfacial energy band structure for high-performance inverted structure perovskite solar cells	2019	PCBM	C60	MAPbI3	one-step	spin	no	DMF+DMSO	PTAA	no	16.89
Polymeric, Cost-Effective, Dopant-Free Hole Transport Materials for Efficient and Stable Perovskite Solar Cells	2019	SnO2	no	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.7
Preparation of Tortuous 3D γ-CsPbI3 Films at Low Temperature by CaI2 as Dopant for Highly Efficient Perovskite Solar Cells	2019	TiO2	TiO2	others	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	9.32
Tailored Phase Transformation of CsPbI2Br Films by Copper (II) Bromide for HighPerformance All-Inorganic Perovskite	2019	TiO2	no	CsPbI3	one-step	spin	chlorobenzene	DMSO	spiro-OMeTAD	Li+TBP	13.24

Solar Cells											
Pulsed Laser Deposition of CsPbBr3 Films for Application in Perovskite Solar Cells	2019	TiO2	TiO2	CsPbI3	one-step	others	no	no	spiro-OMeTAD	Li+TBP	6.3
Fine Multi-Phase Alignments in 2D Perovskite Solar Cells with Efficiency over 17% via Slow Post-Annealing	2019	BCP	C60	MAPbI3	one-step	others	no	DMF	PTAA	no	17.16
Fine Multi-Phase Alignments in 2D Perovskite Solar Cells with Efficiency over 17% via Slow Post-Annealing	2019	BCP	C60	MAPbI3	one-step	others	no	DMF	PTAA	no	15.6
Polarized Ferroelectric Polymers for High-Performance Perovskite Solar Cells	2019	TiO2	no	others	one-step	spin	chlorobenzene	DMSO	spiro-OMeTAD	no	21.38
Investigation of Oxygen Passivation for High-Performance AllInorganic Perovskite Solar Cells	2019	SnO2	no	CsPbI3	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	13
LiTFSI-Free spiro-OMeTAD-Based Perovskite Solar Cells with Power Conversion Efficiencies Exceeding 19%	2019	TiO2	TiO2	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.5
LiTFSI-Free spiro-OMeTAD-Based Perovskite Solar Cells with Power Conversion Efficiencies Exceeding 19%	2019	TiO2	TiO2	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	no	14.3
Composition Stoichiometry of Cs2AgBiBr6 Films for Highly Efficient Lead-Free Perovskite Solar Cells	2019	TiO2	no	others	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	2.48
Influence of Cl Incorporation in Perovskite Precursor on the Crystal Growth and Storage	2019	TiO2	no	FA-MA	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	15.2

Stability of Perovskite Solar Cells											
Influence of Cl Incorporation in Perovskite Precursor on the Crystal Growth and Storage Stability of Perovskite Solar Cells	2019	TiO2	no	FA-MA	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	16.8
Influence of Cl Incorporation in Perovskite Precursor on the Crystal Growth and Storage Stability of Perovskite Solar Cells	2019	TiO2	no	FA-MA	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	19.1
Influence of Cl Incorporation in Perovskite Precursor on the Crystal Growth and Storage Stability of Perovskite Solar Cells	2019	TiO2	no	FA-MA	one-step	spin	no	DMF	spiro-OMeTAD	Li+TBP	19.2
Efficient and Stable FASnI3 Perovskite Solar Cells with Effective Interface Modulation by Low-Dimensional Perovskite Layer	2019	PCBM	no	FASnI3	one-step	spin	no	no	PEDOT:PSS	no	4.77
Alkali Chlorides for the Suppression of the Interfacial Recombination in Inverted Planar Perovskite Solar Cells	2019	NiOx	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	PCBM	no	16.67
Highly Efficient and Stable Solar Cells Based on Crystalline Oriented 2D/3D Hybrid Perovskite	2019	SnO2	no	others	two-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	21.1
UV-Inert ZnTiO3 Electron Selective Layer for Photostable Perovskite Solar Cells	2019	ZTO	no	Cs-FA-MA	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.8
UV-Inert ZnTiO3 Electron Selective Layer for Photostable Perovskite Solar Cells	2019	TiO2	no	Cs-FA-MA	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	17.6
Chemical Composition and Phase Evolution in DMAI-Derived Inorganic Perovskite Solar	2019	TiO2	TiO2	Cs-MA	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	14.4

Cells											
Chemical Composition and Phase Evolution in DMAI-Derived Inorganic Perovskite Solar Cells	2019	TiO2	TiO2	CsPbI3	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP	10.7
Monoammonium Porphyrin for Blade-Coating Stable Large-Area Perovskite Solar Cells with >18% Efficiency	2019	TiO2	no	MAPbI3	one-step	spin	no	DMF+DMSO	PCBM	no	18.26
Optimal Interfacial Engineering with Different Length of Alkylammonium Halide for Efficient and Stable Perovskite Solar Cells	2019	TiO2	TiO2	FA-MA	one-step	spin	IPA	DMF+DMSO	spiro-OMeTAD	Li+TBP	22.9
Triamine-Based Aromatic Cation as a Novel Stabilizer for Efficient Perovskite Solar Cells	2019	SnO2	no	Cs-FA-MA	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.9
Achieving Long-Term Operational Stability of Perovskite Solar Cells with a Stabilized Efficiency Exceeding 20% after 1000 h	2019	TiO2	TiO2	FA-MA	one-step	spin	diethyl ether	DMF+DMSO	PTAA	no	20
NbF5: A Novel α-Phase Stabilizer for FA-Based Perovskite Solar Cells with High Efficiency	2019	TiO2	no	FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.3
Origins of High Performance and Degradation in the Mixed Perovskite Solar Cells	2019	TiO2	no	FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	PTAA	Li+TBP	20.02
Binary solvent engineering for high-performance two-dimensional perovskite solar cells	2019	TiO2	no	MAPbI3	one-step	spin	no	DMF+DMSO	spiro-OMeTAD	Li+TBP	10.3
High-Performance Perovskite Solar Cells with Excellent Humidity and Thermo-Stability via	2019	NiOx	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	PCBM	others	17.4

Fluorinated Perylenediimide											
High-Performance Perovskite Solar Cells with Excellent Humidity and Thermo-Stability via Fluorinated Perylenediimide	2019	NiOx	no	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	PCBM	others	14.78
2D Intermediate Suppression for Efficient RuddlesdenPopper (RP) Phase Lead-Free Perovskite Solar Cells	2019	C60	no	FASnI3	one-step	spin	chlorobenzene	DMF+DMSO	PEDOT:PSS	no	8.82
Improving Charge Transport via Intermediate-Controlled Crystal Growth in 2D Perovskite Solar Cells	2019	TiO2	no	others	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	12
Improving Charge Transport via Intermediate-Controlled Crystal Growth in 2D Perovskite Solar Cells	2019	TiO2	no	MAPbI3	one-step	spin	chlorobenzene	DMSO	spiro-OMeTAD	Li+TBP	6.5
Niobium Incorporation into CsPbI2Br for Stable and Efficient Allinorganic Perovskite Solar Cells	2019	SnO2	no	CsPbI2Br	one-step	spin	no	DMF+DMSO	Without HTL	no	9.05
On the Relation between the Open-Circuit Voltage and Quasi-Fermi Level Splitting in Efficient Perovskite Solar Cells	2019	BCP	C60	Cs-FA-MA	one-step	spin	diethyl ether	DMF+DMSO	PTAA	others	19.4
On the Relation between the Open-Circuit Voltage and Quasi-Fermi Level Splitting in Efficient Perovskite Solar Cells	2019	BCP	C60	Cs-FA-MA	one-step	spin	diethyl ether	DMF+DMSO	P3HT	no	14.2
Fabrication of Efficient and Stable CsPbI3 Perovskite Solar Cells through Cation Exchange Process	2019	TiO2	no	CsPbI3	one-step	spin	anisole	DMF	P3HT	no	6.8

Low-Frequency Carrier Kinetics in Perovskite Solar Cells	2019	SnO2	no	CH3NH3PbI3	one-step	spin	diethyl ether	no	PTAA	no	10
Low-Frequency Carrier Kinetics in Perovskite Solar Cells	2019	SnO2	no	CH3NH3PbI3	one-step	spin	diethyl ether	no	spiro-OMeTAD	Li+TBP	15
Overcoming Zinc Oxide Interface Instability with a Methylammonium-Free Perovskite for High-Performance Solar Cells	2019	ZnO	no	Cs-FA	one-step	spin	anisole	DMF+DMSO	spiro-OMeTAD	Li+TBP	18
Overcoming Zinc Oxide Interface Instability with a Methylammonium-Free Perovskite for High-Performance Solar Cells	2019	SnO2	no	Cs-FA	one-step	spin	anisole	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.7
Cation-Exchange Approach for Fabrication of Efficient Methylammonium Tin Iodide Perovskite Solar Cells	2019	TiO2	TiO2	MASnI3	one-step	spin	diethyl ether	DMF+DMSO	PTAA	no	0.11
Cation-Exchange Approach for Fabrication of Efficient Methylammonium Tin Iodide Perovskite Solar Cells	2019	TiO2	TiO2	MASnI3	two-step	spin	diethyl ether	DMF+DMSO	PTAA	no	7.13
High-Performance Perovskite Solar Cells with Enhanced Environmental Stability Based on a (p-FC6H4C2H4NH3)2[PbI4] Capping Layer	2019	TiO2	TiO2	Cs-FA-MA	two-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	18
Novel Surface Passivation for Stable FA0.85MA0.15PbI3 Perovskite Solar Cells with 21.6% Efficiency	2019	TiO2	no	FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK210	19.55
Perovskite/Graphene Solar Cells without a Hole-Transport Layer	2019	TiO2	TiO2	HASnI3	two-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	12.6
Perovskite/Graphene Solar Cells without a Hole-Transport Layer	2019	TiO2	TiO2	HASnI3	two-step	spin	diethyl ether	DMF+DMSO	spiro-OMeTAD	Li+TBP	2.8

Enhancing electron diffusion length in narrow-bandgap perovskites for efficient monolithic perovskite tandem solar cells	2019	BCP	C60	Cs-FA	one-step	spin	no	DMF+DMSO	PEDOT:PSS	no	22.7
Defect passivation using ultrathin PTAA layers for efficient and stable perovskite solar cells with a high fill factor and eliminated hysteresis	2019	PCBM	no	MAPbI3	one-step	spin	no	GBL+DMSO	PEDOT:PSS	no	16.28
Interface engineering of low temperature processed all-inorganic CsPbI2Br perovskite solar cells toward PCE exceeding 14%	2019	SnO2	no	CsPbI2Br	one-step	spin	no	DMSO	spiro-OMeTAD	Li+TBP+FK 209	13.4
Inverted All-Inorganic CsPbI2Br Perovskite Solar Cells with Promoted Efficiency and Stability by Nickel Incorporation	2019	PCBM	C60	CsPbI2Br	one-step	spin	no	DMSO	P3CT	no	11.8
Inverted All-Inorganic CsPbI2Br Perovskite Solar Cells with Promoted Efficiency and Stability by Nickel Incorporation	2019	PCBM	C60	CsPbI3	one-step	spin	no	DMSO	P3CT	no	12.674
Inverted All-Inorganic CsPbI2Br Perovskite Solar Cells with Promoted Efficiency and Stability by Nickel Incorporation	2019	PCBM	C60	CsPbI3	one-step	spin	no	DMSO	P3CT	no	12.7
Inverted All-Inorganic CsPbI2Br Perovskite Solar Cells with Promoted Efficiency and Stability by Nickel Incorporation	2019	PCBM	C60	CsPbI3	one-step	spin	no	DMSO	P3CT	no	11.1
Inverted All-Inorganic CsPbI2Br Perovskite Solar Cells with Promoted Efficiency and Stability by Nickel Incorporation	2019	PCBM	C60	CsPbI3	one-step	spin	no	DMSO	P3CT	no	10.06
Inverted All-Inorganic CsPbI2Br Perovskite Solar Cells with Promoted Efficiency and Stability by Nickel Incorporation	2019	PCBM	C60	CsPbI3	one-step	spin	no	DMSO	P3CT	no	4.9

Strain Relaxation and Light Management in Tin−Lead Perovskite Solar Cells to Achieve High Efficiencies	2019	PCBM	C60	Cs-FA-MA	one-step	spin	toluene	DMF+DMSO	PEDOT:PSS	no	18.92
Strain Relaxation and Light Management in Tin−Lead Perovskite Solar Cells to Achieve High Efficiencies	2019	PCBM	C60	FA-MA	one-step	spin	toluene	DMF+DMSO	PEDOT:PSS	no	17.69
Strain Relaxation and Light Management in Tin−Lead Perovskite Solar Cells to Achieve High Efficiencies	2019	PCBM	C60	Cs-FA-MA	one-step	spin	toluene	DMF+DMSO	PEDOT:PSS	no	18.45
Strain Relaxation and Light Management in Tin−Lead Perovskite Solar Cells to Achieve High Efficiencies	2019	PCBM	C60	Cs-FA-MA	one-step	spin	toluene	DMF+DMSO	PEDOT:PSS	no	17.29
Combustion Synthesized Zinc Oxide Electron-Transport Layers for Efficient and Stable Perovskite Solar Cells	2019	others	no	MAPBI3	one-step	spin	diethyl ethe	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	1.98
Combustion Synthesized Zinc Oxide Electron-Transport Layers for Efficient and Stable Perovskite Solar Cells	2019	others	no	MAPBI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	12.23
Combustion Synthesized Zinc Oxide Electron-Transport Layers for Efficient and Stable Perovskite Solar Cells	2019	others	no	MAPBI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	16.47
Combustion Synthesized Zinc Oxide Electron-Transport Layers for Efficient and Stable Perovskite Solar Cells	2019	others	no	Cs-FA-MA	one-step	spin	diethyl ethe	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	7.23
Combustion Synthesized Zinc Oxide Electron-Transport Layers for Efficient and Stable Perovskite Solar Cells	2019	others	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	14.75

Combustion Synthesized Zinc Oxide Electron-Transport Layers for Efficient and Stable Perovskite Solar Cells	2019	others	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	18.18
Combustion Synthesized Zinc Oxide Electron-Transport Layers for Efficient and Stable Perovskite Solar Cells	2019	others	no	Cs-FA	one-step	spin	diethyl ethe	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	16.06
Combustion Synthesized Zinc Oxide Electron-Transport Layers for Efficient and Stable Perovskite Solar Cells	2019	others	no	Cs-FA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	15.97
Combustion Synthesized Zinc Oxide Electron-Transport Layers for Efficient and Stable Perovskite Solar Cells	2019	others	no	Cs-FA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	19.09
Influence of hole transport material ionization energy on the performance of perovskite solar cells	2019	BCP	C60	MAPBI3	one-step	spin	no	DMF+DMSO	others	no	14.4
Influence of hole transport material ionization energy on the performance of perovskite solar cells	2019	BCP	C60	MAPBI3	one-step	spin	no	DMF+DMSO	others	no	16.3
Influence of hole transport material ionization energy on the performance of perovskite solar cells	2019	BCP	C60	MAPBI3	one-step	spin	no	DMF+DMSO	others	no	12.2
In situ growth of perovskite stacking layers for high-efficiency carbon-based hole conductor free perovskite solar cells	2019	c-TiO2	m-TiO2	MAPBI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK209	10.7
Enhanced performance of tin-based perovskite solar cells induced by an ammonium hypophosphite additive	2019	PCBM	no	FASnI3	one-step	spin	chlorobenzene	DMF+DMSO	others	no	7.34

Fluorinated Low-Dimensional Ruddlesden–Popper Perovskite Solar Cells with over 17% Power Conversion Efficiency and Improved Stability	2019	PCBM	no	MAPbI3	one-step	spin	no	DMF	PTAA	no	16.34
Fluorinated Low-Dimensional Ruddlesden–Popper Perovskite Solar Cells with over 17% Power Conversion Efficiency and Improved Stability	2019	PCBM	no	MAPbI3	one-step	spin	no	DMF	PTAA	no	9.7
Amphiphilic Fullerenes Employed to Improve the Quality of Perovskite Films and the Stability of Perovskite Solar Cells	2019	PCBM	BCP	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	others	no	14.36
Flexible quintuple cation perovskite solar cells with high efficiency	2019	SnO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.32
Flexible quintuple cation perovskite solar cells with high efficiency	2019	SnO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	18.68
Flexible quintuple cation perovskite solar cells with high efficiency	2019	SnO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.03
Flexible quintuple cation perovskite solar cells with high efficiency	2019	SnO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.46
Flexible quintuple cation perovskite solar cells with high efficiency	2019	SnO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.75
Flexible quintuple cation perovskite solar cells with high efficiency	2019	SnO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	20.13
Flexible quintuple cation perovskite solar cells with high efficiency	2019	SnO2	no	Cs-FA-MA	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP	19.15

Titanium-carbide MXenes for work function and interface engineering in perovskite solar cells	2019	TiO2	TiO2	MAPbI3	one-step	spin	chlorobenzene	DMF+DMSO	spiro-OMeTAD	Li+TBP+FK 209	15.2
Perovskite Ink with an Ultrawide Processing Window for Efficient and Scalable Perovskite Solar Cells in Ambient Air	2019	SnO2	no	MAPbI3	two-step	spin	diethyl ethe	DMF+DMSO +others	spiro-OMeTAD	Li+TBP+FK 209	11.8
A Low-temperature carbon electrode with benign perovskite compatibility and high flexibility in Carbon based perovskite solar cells	2019	TiO2	TiO2	Cs-FA-MA	one-step	spin	no	DMF+DMSO	Without HTL	no	11.7
A Low-temperature carbon electrode with benign perovskite compatibility and high flexibility in Carbon based perovskite solar cells	2019	TiO2	TiO2	Cs-FA-MA	one-step	spin	no	DMF+DMSO	PEDOT:PSS	no	13.6
A Low-temperature carbon electrode with benign perovskite compatibility and high flexibility in Carbon based perovskite solar cells	2019	SnO2	no	Cs-FA-MA	one-step	spin	no	DMF+DMSO	PEDOT:PSS	no	7.04
Dopant-Free, Amorphous–Crystalline Heterophase SnO2 Electron Transport Bilayer Enables >20% Efficiency in Triple-Cation Perovskite Solar Cells	2020	Bi-SnO2	no	Cs0.05(FAPbI3)0.85(MAPbBr3)0.15	one-step	spin 2-3	ethyl acetate+hexane	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.39
Dopant-Free, Amorphous–Crystalline Heterophase SnO2 Electron Transport Bilayer Enables >20% Efficiency in Triple-Cation Perovskite Solar Cells	2020	SG-SnO2	no	Cs0.05(FAPbI3)0.85(MAPbBr3)0.15	one-step	spin 2-3	ethyl acetate+hexane	DMF+DMSO	Spiro-OMeTAD	Li+TBP	18.67

Dopant-Free, Amorphous–Crystalline Heterophase SnO2 Electron Transport Bilayer Enables >20% Efficiency in Triple-Cation Perovskite Solar Cells	2020	NP-SnO2	no	Cs0.05(FAPbI3)0.85(MAPbBr3)0.15	one-step	spin 2-3	ethyl acetate+hexane	DMF+DMSO	Spiro-OMeTAD	Li+TBP	18.49
FAPbI3-Based Perovskite Solar Cells Employing Hexyl-Based Ionic Liquid with an Efficiency Over 20% and Excellent Long-Term Stability	2020	TiO2	mTiO2	FAPbI3-HMII	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.6
FAPbI3-Based Perovskite Solar Cells Employing Hexyl-Based Ionic Liquid with an Efficiency Over 20% and Excellent Long-Term Stability	2020	TiO2	mTiO2	FAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.1
TiO2/WO3 Bilayer as Electron T ransport Layer for Efficient Planar Perovskite Solar Cell with Efficiency Exceeding 20%	2020	TiO2	WO3	MAPbI3	two-step	spin	no	DMF	Spiro-OMeTAD	Li+TBP	20.14
Acetic Acid Assisted Crystallization Strategy for High Efficiency and Long-T erm Stable Perovskite Solar Cell	2020	TiO2	mTiO2	Cs0.05FA0.80MA0.15Pb(I0.85Br0.15)3	one-step	spin 2-3	acetic acid	DMF+DMSO	Spiro-OMeTAD	Li+TBP	22
Acetic Acid Assisted Crystallization Strategy for High Efficiency and Long-T erm Stable Perovskite Solar Cell	2020	TiO2	mTiO2	Cs0.05FA0.90MA0.05Pb(I0.95Br0.05)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	23
Low-Temperature-Processed WOxas Electron Transfer Layer for Planar Perovskite Solar Cells Exceeding 20% Efficiency	2020	E-WOx	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	14.32
Low-Temperature-Processed WOxas Electron Transfer Layer for Planar Perovskite Solar Cells Exceeding 20% Efficiency	2020	B-WOx	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.85

Low-Temperature-Processed WOxas Electron Transfer Layer for Planar Perovskite Solar Cells Exceeding 20% Efficiency	2020	H-WOx	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.16
Low-Temperature-Processed WOxas Electron Transfer Layer for Planar Perovskite Solar Cells Exceeding 20% Efficiency	2020	H-WOx	no	(FAPbI3)1-x(MAPbBr3)x	two-step	spin	no	DMF+DMSO +IPA	Spiro-OMeTAD	Li+TBP	20.77
Over 20% Efficiency in Methylammonium Lead Iodide Perovskite Solar Cells with Enhanced Stability via “in Situ Solidification” of the TiO2 Compact Layer	2020	CL-GP TiO2	no	MAPbI3	one-step	spin	no	DMF	Spiro-OMeTAD	Li+TBP	20.43
Over 20% Efficiency in Methylammonium Lead Iodide Perovskite Solar Cells with Enhanced Stability via “in Situ Solidification” of the TiO2 Compact Layer	2020	CL-ND TiO2	no	MAPbI3	one-step	spin	no	DMF	Spiro-OMeTAD	Li+TBP	17.51
Mediator−Antisolvent Strategy to Stabilize All-Inorganic CsPbI3 for Perovskite Solar Cells with Efficiency Exceeding 16%	2020	SnO2	no	MAI-CsPbI3	one-step	spin	PCBM+chloro benzene	DMF	Spiro-OMeTAD	Li+TBP	16.04
Mediator−Antisolvent Strategy to Stabilize All-Inorganic CsPbI3 for Perovskite Solar Cells with Efficiency Exceeding 16%	2020	SnO2	no	CsPbI3	one-step	spin	PCBM+chloro benzene	DMF	Spiro-OMeTAD	Li+TBP	14.34
Mediator−Antisolvent Strategy to Stabilize All-Inorganic CsPbI3 for Perovskite Solar Cells with Efficiency Exceeding 16%	2020	SnO2	no	CsPbI3	one-step	spin	chlorobenzene	DMF	Spiro-OMeTAD	Li+TBP	10.6
Dual Functions of Crystallization Control and Defect Passivation Enabled by an Ionic Compensation Strategy for Stable and High-Efficient Perovskite Solar Cells	2020	SnO2	no	ITU-MAPbI3	one-step	spin	ethyl acetate	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.39

Dual Functions of Crystallization Control and Defect Passivation Enabled by an Ionic Compensation Strategy for Stable and High-Efficient Perovskite Solar Cells	2020	SnO2	no	MAPbI3	one-step	spin	ethyl acetate	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.75
1000 h Operational Lifetime Perovskite Solar Cells by Ambient Melting Encapsulation	2020	SnO2	no	Rb0.09Cs0.06[(FA0.85MA0.15)Pb(Br0.15I0.85)3]	one-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.5
A holistic approach to interface stabilization for efficient perovskite solar modules with over 2,000-hour operational stability	2020	SnO2-EDTAK	no	Cs0.05FA0.54MA0.41Pb(I0.98Br0.02)3-EAMA	two-step	spin	no	DMF+DMSO+IPA	Spiro-OMeTAD/P3HT	Li+TBP	16.1
A holistic approach to interface stabilization for efficient perovskite solar modules with over 2,000-hour operational stability	2020	SnO2-EDTAK	no	Cs0.05FA0.54MA0.41Pb(I0.98Br0.02)3-EAMA	two-step	spin	no	DMF+DMSO+IPA	Spiro-OMeTAD	Li+TBP	16.6
A holistic approach to interface stabilization for efficient perovskite solar modules with over 2,000-hour operational stability	2020	SnO2-EDTAK	no	Cs0.05FA0.54MA0.41Pb(I0.98Br0.02)3	two-step	spin	no	DMF+DMSO+IPA	Spiro-OMeTAD	Li+TBP	13.7
A holistic approach to interface stabilization for efficient perovskite solar modules with over 2,000-hour operational stability	2020	SnO2	no	Cs0.05FA0.54MA0.41Pb(I0.98Br0.02)3	two-step	spin	no	DMF+DMSO+IPA	Spiro-OMeTAD	Li+TBP	11.4
Intermolecular π–π Conjugation Self-Assembly to Stabilize Surface Passivation of Highly Efficient Perovskite Solar Cells	2020	TiO2	PCBA	PbI2,MABr,FAI,MACl,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.8
Intermolecular π–π Conjugation Self-Assembly to Stabilize Surface Passivation of	2020	TiO2	PCBA	TPPO/PbI2, MABr,FAI,M	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	21.4

Highly Efficient Perovskite Solar Cells				ACl,CsI							
Intermolecular π–π Conjugation Self-Assembly to Stabilize Surface Passivation of Highly Efficient Perovskite Solar Cells	2020	TiO2	PCBA	TBPO/PbI2, MABr,FAI,MACl,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	22.1
Efficient perovskite solar cells via improved carrier management	2020	SnO2	no	PbI2,FAI,MACl,MAPbBr3	one-step	spin 2-3	diethyl ether	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	25.2
Dopant-Free, Donor–Acceptor-Type Polymeric Hole-Transporting Materials for the Perovskite Solar Cells with Power Conversion Efficiencies over 20%	2020	SnO2	no	PbI2,FAI,PbBr2,MABr,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PBDTT	Li+TBP+FK209	20.28
Dopant-Free, Donor–Acceptor-Type Polymeric Hole-Transporting Materials for the Perovskite Solar Cells with Power Conversion Efficiencies over 20%	2020	SnO2	no	PbI2,FAI,PbBr2,MABr,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PBTTT	Li+TBP+FK209	19.48
Dopant-Free, Donor–Acceptor-Type Polymeric Hole-Transporting Materials for the Perovskite Solar Cells with Power Conversion Efficiencies over 20%	2020	SnO2	no	PbI2,FAI,PbBr2,MABr,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	18.32
Dopant-Free, Donor–Acceptor-Type Polymeric Hole-Transporting Materials for the Perovskite Solar Cells with Power Conversion Efficiencies over 20%	2020	SnO2	no	PbI2,FAI,PbBr2,MABr,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	P3HT	Li+TBP+FK209	13.98
Lewis-Base Containing spiro Type Hole Transporting Materials for High-Performance Perovskite Solar Cells with Efficiency	2020	SnO2	no	PbI2,FAI,PbBr2,MABr,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-CN	Li+TBP	19.9

Approaching 20%											
Lewis-Base Containing spiro Type Hole Transporting Materials for High-Performance Perovskite Solar Cells with Efficiency Approaching 20%	2020	SnO2	no	PbI2,FAI,PbBr2,MABr,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-PS	Li+TBP	18.08
Lewis-Base Containing spiro Type Hole Transporting Materials for High-Performance Perovskite Solar Cells with Efficiency Approaching 20%	2020	SnO2	no	PbI2,FAI,PbBr2,MABr,CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.85
p-Doping of a hole transport material via a poly(ionic-liquid) for over 20% efficiency and hysteresis-free perovskite solar cells	2020	TiO2	mTiO2	K0.05(MA0.15FA0.85)0.95PbI2.55Br0.45	one-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	PVBI-TFSI	20.33
p-Doping of a hole transport material via a poly(ionic-liquid) for over 20% efficiency and hysteresis-free perovskite solar cells	2020	TiO2	mTiO2	K0.05(MA0.15FA0.85)0.95PbI2.55Br0.45	one-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.71
RbCs(MAFA)PbI3 perovskite solar cell with 22.81% efficiency using the precise ions cascade regulation	2020	NiOx	no	Rb0.2Cs0.2(MA0.3FA0.3)PbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	22.81
RbCs(MAFA)PbI3 perovskite solar cell with 22.81% efficiency using the precise ions cascade regulation	2020	NiOx	no	(MA0.5FA0.5)PbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	17.15
RbCs(MAFA)PbI3 perovskite solar cell with 22.81% efficiency using the precise ions cascade regulation	2020	NiOx	no	Rb0.05Cs0.05(MA0.45FA0.45)PbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	19.16

RbCs(MAFA)PbI3 perovskite solar cell with 22.81% efficiency using the precise ions cascade regulation	2020	NiOx	no	Rb0.1Cs0.1(MA0.4FA0.4)PbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	20.6
RbCs(MAFA)PbI3 perovskite solar cell with 22.81% efficiency using the precise ions cascade regulation	2020	NiOx	no	Rb0.15Cs0.15(MA0.35FA0.35)PbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	21.67
RbCs(MAFA)PbI3 perovskite solar cell with 22.81% efficiency using the precise ions cascade regulation	2020	NiOx	no	Rb0.25Cs0.25(MA0.25FA0.25)PbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	21.05
Efficient and stable Ruddlesden–Popper perovskite solar cell with tailored interlayer molecular interaction	2020	PCBM	no	(MTEA)2(MA)4Pb5I16	one-step	spin	no	MAAc	PEDOT:PSS	no	18.06
Stable perovskite solar cells with efficiency exceeding 24.8% and 0.3-V voltage loss	2020	TiO2	mTiO2	FAPbI3	one-step	spin	diethyl ether	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	23.44
Stable perovskite solar cells with efficiency exceeding 24.8% and 0.3-V voltage loss	2020	TiO2	mTiO2	FAPbI3	one-step	spin	diethyl ether	DMF+DMSO	Spiro-mF	Li+TBP+FK209	24.82
Stable perovskite solar cells with efficiency exceeding 24.8% and 0.3-V voltage loss	2020	TiO2	mTiO2	FAPbI3	one-step	spin	diethyl ether	DMF+DMSO	Spiro-oF	Li+TBP+FK209	23.56
Controlled n-Doping in Air-Stable CsPbI2Br Perovskite Solar Cells with a Record Efficiency of 16.79%	2020	TiO2	no	Ca/CsPbI2Br	one-step	spin 2-3	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	16.79
Controlled n-Doping in Air-Stable CsPbI2Br Perovskite Solar Cells with a Record Efficiency of 16.79%	2020	TiO2	no	CsPbI2Br	one-step	spin 2-3	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	14.89
Tailored Amphiphilic Molecular Mitigators for Stable Perovskite Solar Cells with 23.5%	2020	TiO2	mTiO2	Cs0.05FA0.85MA0.10Pb(I	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	23.5

Efficiency				0.97Br0.03)3 /tBBAI							
Tailored Amphiphilic Molecular Mitigators for Stable Perovskite Solar Cells with 23.5% Efficiency	2020	TiO2	mTiO2	Cs0.05FA0.85MA0.10Pb(I0.97Br0.03)3 /PEAI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	22.7
Tailored Amphiphilic Molecular Mitigators for Stable Perovskite Solar Cells with 23.5% Efficiency	2020	TiO2	mTiO2	Cs0.05FA0.85MA0.10Pb(I0.97Br0.03)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.1
Stable and High-Efficiency Methylammonium-Free Perovskite Solar Cells	2020	TiO2	mTiO2-SnO2	(Cs0.17FA0.83)Pb(I0.89Br0.08Cl0.03)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	20.5
Stable and High-Efficiency Methylammonium-Free Perovskite Solar Cells	2020	TiO2	mTiO2-SnO2	(Cs0.08FA0.8MA0.12)Pb(I0.88Br0.12)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	19
Gradient Energy Alignment Engineering for Planar Perovskite Solar Cells with Efficiency Over 23%	2020	In2O3	SnO2	PbI2,FAI,MAI,MACl	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	23.24
Gradient Energy Alignment Engineering for Planar Perovskite Solar Cells with Efficiency Over 23%	2020	SnO2	0	PbI2,FAI,MAI,MACl	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	21.42
Gradient Energy Alignment Engineering for Planar Perovskite Solar Cells with Efficiency Over 23%	2020	In2O3	0	PbI2,FAI,MAI,MACl	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.21

Precursor Engineering for Ambient-Compatible Antisolvent-Free Fabrication of High-Efficiency CsPbI2Br Perovskite Solar Cells	2020	TiO2	no	CsPbI2Br	one-step	spin 2-3	no	DMSO	PTAA	TPFPB	16.14
High-Performance CsPbIxBr3-x All-Inorganic Perovskite Solar Cells with Efficiency over 18% via Spontaneous Interfacial Manipulation	2020	SnO2	no	GABr/CsPbIxBr3-x	one-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	18.06
High-Performance CsPbIxBr3-x All-Inorganic Perovskite Solar Cells with Efficiency over 18% via Spontaneous Interfacial Manipulation	2020	SnO2	no	CsPbIxBr3-x	one-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	13.64
Boosting Multiple Interfaces by Co-Doped Graphene Quantum Dots for High Efficiency and Durability Perovskite Solar Cells	2020	α-Fe2O3	NSGQDS	MAPbI3/NSGQDS	one-step	spin	chlorobenzene	DMF	Spiro-OMeTAD	Li+TBP	19.2
Double-Sided Surface Passivation of 3D Perovskite Film for High-Efficiency Mixed-Dimensional Perovskite Solar Cells	2020	TiO2	mTiO2-PMMA/PCBM	n-BAI-Cs0.07Rb0.03FA0.765MA0.135PbI2.55Br0.45-n-BAI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	22.77
Highly stable and Efficient Perovskite Solar Cells Based on FAMA-Perovskite-Cu:NiO Composites with 20.7% Efficiency and 80.5% Fill Factor	2020	TiO2	mAl2O3-Cu:NiO	FA0.026MA0.974PbI3−yCly-Cu:NiO	one-step	spin	no	no	Spiro-OMeTAD	Li+TBP	20.67
Highly stable and Efficient Perovskite Solar Cells Based on FAMA-Perovskite-Cu:NiO Composites with 20.7% Efficiency and 80.5% Fill Factor	2020	TiO2	mAl2O3-Cu:NiO	MAPbI3−yCly	one-step	spin	no	no	Spiro-OMeTAD	Li+TBP	16.2

Highly stable and Efficient Perovskite Solar Cells Based on FAMA-Perovskite-Cu:NiO Composites with 20.7% Efficiency and 80.5% Fill Factor	2020	TiO2	mAl2O3-Cu:NiO	MAPbI3−yCly-Cu:NiO	one-step	spin	no	no	Spiro-OMeTAD	Li+TBP	17.7
Nonaromatic Green-Solvent-Processable, Dopant-Free,and Lead-Capturable Hole Transport Polymers in Perovskite Solar Cells with High Efficiency	2020	SnO2	no	Cs0.06FA0.78MA0.16Pb0.94I2.4Br0.48	one-step	spin	chlorobenzene	DMF+DMSO	alkoxy-PTEG	no	21.2
Synergistic Cascade Carrier Extraction via Dual Interfacial Positioning of Ambipolar Black Phosphorene for High-Efficiency Perovskite Solar Cells	2020	TiO2	mTiO2-BP	Cs0.05MA0.16FA0.79Pb(I0.83Br0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.83
Synergistic Cascade Carrier Extraction via Dual Interfacial Positioning of Ambipolar Black Phosphorene for High-Efficiency Perovskite Solar Cells	2020	TiO2	mTiO2	Cs0.05MA0.16FA0.79Pb(I0.83Br0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	16.95
High-Efficiency CsPbI2Br Perovskite Solar Cells with Dopant-Free Poly(3-hexylthiophene) Hole Transporting Layers	2020	SnO2	no	CsPbI2Br	one-step	spin	no	DMSO	P3HT	no	15.5
Graphdiyne:Bridging SnO2and Perovskite in Planar Solar Cells	2020	GDY–SnO2	no	CsMAFAPbIBr	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	21.11
Graphdiyne:Bridging SnO2and Perovskite in Planar Solar Cells	2020	SnO2	no	CsMAFAPbIBr	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.17
Red-Carbon-Quantum-Dot-Doped SnO2 Composite with Enhanced Electron Mobility for Efficient and Stable Perovskite Solar Cells	2020	SnO2-RCQs	no	Cs0.05FA0.81MA0.14PbI2.55Br0.45	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	no	22.77

Red-Carbon-Quantum-Dot-Doped SnO2 Composite with Enhanced Electron Mobility for Efficient and Stable Perovskite Solar Cells	2020	SnO2	no	Cs0.05FA0.81MA0.14PbI2.55Br0.45	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	no	19.15
Simultaneous Contact and Grain-Boundary Passivation in Planar Perovskite Solar Cells Using SnO2-KCl Composite Electron Transport Layer	2020	SnO2-KCl	no	MAFAPbIBr	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	22.2
Simultaneous Contact and Grain-Boundary Passivation in Planar Perovskite Solar Cells Using SnO2-KCl Composite Electron Transport Layer	2020	SnO2	no	MAFAPbIBr	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.2
Dynamical Evolution of the 2D/3D Interface: A Hidden Driver behind Perovskite Solar Cell Instability	2020	TiO2	mTiO2	[(FAPbI3)0.87(MAPbBr3)0.13]0.92(CsPbI3)0.08-2-TMAI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	19.97
Dynamical Evolution of the 2D/3D Interface: A Hidden Driver behind Perovskite Solar Cell Instability	2020	TiO2	mTiO2	[(FAPbI3)0.87(MAPbBr3)0.13]0.92(CsPbI3)0.08-3-TMAI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	20.59
Dynamical Evolution of the 2D/3D Interface: A Hidden Driver behind Perovskite Solar Cell Instability	2020	TiO2	mTiO2	[(FAPbI3)0.87(MAPbBr3)0.13]0.92(CsPbI3)0.08-2-TEAI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	19.42

Highly Efficient Perovskite Solar Cells Enabled by Multiple Ligand Passivation	2020	SnO2	no	PbI2,FAI,MABr,MACl/ML	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.9
Highly Efficient Perovskite Solar Cells Enabled by Multiple Ligand Passivation	2020	SnO2	no	PbI2,FAI,MABr,MACl	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	18.4
Optimization of CH3NH3PbI3perovskite solar cells: A theoretical and experimental study	2020	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	Spiro-OMeTAD	Li+TBP	20.26
In-situ fabrication of P3HT passivating layer with hole extraction ability for enhanced performance of perovskite solar cell	2020	SnO2	no	Cs0.05(MA0.17FA0.83)0.95Pb(I0.83Br0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20
Structural Modification of Triphenylamine Derivatives vs the Minimization of Carrier Losses for Efficient Perovskite Solar Cells	2020	TiO2	mTiO2-SnO2	Cs0.1(MA0.15FA0.85)Pb(I0.85Br)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	CS02	Li+TBP+FK209	15.4
Structural Modification of Triphenylamine Derivatives vs the Minimization of Carrier Losses for Efficient Perovskite Solar Cells	2020	TiO2	mTiO2-SnO2	Cs0.1(MA0.15FA0.85)Pb(I0.85Br)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	CS05	Li+TBP+FK209	18.05
Structural Modification of Triphenylamine Derivatives vs the Minimization of Carrier Losses for Efficient Perovskite Solar Cells	2020	TiO2	mTiO2-SnO2	Cs0.1(MA0.15FA0.85)Pb(I0.85Br)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	CS04	Li+TBP+FK209	19.38
Simultaneous Power Conversion Efficiency and Stability Enhancement of Cs2AgBiBr6 Lead-Free Inorganic Perovskite Solar Cell through Adopting a Multifunctional Dye Interlayer	2020	TiO2	mTiO2	Cs2AgBiBr6, N719	one-step	spin	no	DMSO	Spiro-OMeTAD	Li+TBP	2.84

RbCs(MAFA)PbI3perovskite solar cell with 22.81% efficiency using the precise ions cascade regulation	2020	NiOx	no	RbxCsx(MA(1-2x)/2FA(1-2x)/2)	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	22.81
Record-Efficiency Flexible Perovskite Solar Cell and Module Enabled by a Porous-Planar Structure as an Electron Transport Layer	2020	SnO2	porous-ZSO	(FAPbI3)0.95(MAPbBr3)0.05	one-step	spin 2-3	diethyl ether	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	20.7
Optimization of CH3NH3PbI3perovskite solar cells: A theoretical and experimental study	2020	TiO2	mTiO2	MAPbI3	two-step	spin	no	DMF	Spiro-OMeTAD	Li+TBP	20.26
Self-augmented ion blocking of sandwiched 2D/1D/2D electrode for solution processed high efficiency semitransparent perovskite solar cell	2020	SnO2	no	KxCs0.05(FA0.85MA0.15)0.95Pb(I0.85Br0.15)3	one-step	spin	ethyl acetate	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	14.69
Highly efficient, stable and hysteresis–less planar perovskite solar cell based on chemical bath treated Zn2SnO4 electron transport layer	2020	ZSO	no	Cs0.05(MA0.15FA0.85)0.95Pb(Br0.15I0.85)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	21.3
Water Assisted Formation of Highly Oriented CsPbI2Br Perovskite Films with Solar Cell Efficiency Exceeding 16%	2020	TiO2	no	CsPbI2Br	one-step	spin 2-3	IPA	DMSO	P3HT	Li+TBP	16.47
Precise Stress Control of Inorganic Perovskite Films for Carbon-Based Solar Cells with an Ultrahigh Voltage of 1.622 V	2020	SnO2	no	CsPbBr3	two-step	spin	no	DMF	no	no	10.71

Stabilization of Highly Efficient and Stable Phase-Pure FAPbI3 Perovskite Solar Cells by Molecularly Tailored 2D-Overlayers	2020	TiO2	mTiO2	FAPbI3/IBAI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	22.7
Efficient all-inorganic CsPbI2Br perovskite solar cell with carbon electrode by revealing crystallization kinetics and improving crystal quality	2020	SnO2	no	CsPbI2Br	one-step	spin	ethyl acetate	DMF+DMSO	no	no	12.19
Air-Stable Hybrid Perovskite Solar Cell by Sequential Vapor Deposition in a Single Reactor	2020	TiO2	no	MAPbI3	two-step	CVD	no	no	Spiro-OMeTAD	Li+TBP	14.15
Thin Film (< 200 nm) Perovskite Solar Cell with 18% Efficiency	2020	SnO2	no	s-EAPbI3	one-step	spin	no	DMF	Spiro-OMeTAD	Li+TBP	18.1
Bifunctional Effects of Trichloro(octyl)silane Modification on the Performance and Stability of a Perovskite Solar Cell via Microscopic Characterization Techniques	2020	SnO2	no	PbI2,PbBr2, MABr,FAI,CsI	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.03
Dopant-free methoxy substituted copper(II) phthalocyanine for highly efficient and stable perovskite solar cells	2020	SnO2	no	(FAPbI3)0.85(MAPbBr3)0.15	one-step	spin 2-3	chlorobenzene	DMF+DMSO	CuPc-(OMe)8	Li+TBP	18.3
Interface Engineering of Air-Stable n-Doping FullereneModified TiO2 Electron Transport Layer for Highly Efficient and Stable Perovskite Solar Cells	2020	TiO2	PCBM	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	no	20.14

Planar MgxZn1-xO-based perovskite solar cell with superior ultraviolet light stability	2020	MZO	no	(CsxFA1-xSnI3)0.5(MAPbI3)0.5	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA	no	19.57
Stable and High-Efficiency Methylammonium-Free Perovskite Solar Cells	2020	TiO2	mTiO2-SnO2	(Cs0.17FA0.83) Pb(I0.97Cl0.03)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	20.5
Unraveling Doping Capability of Conjugated Polymers for Strategic Manipulation of Electric Dipole Layer toward Efficient Charge Collection in Perovskite Solar Cells	2020	TiO2	mTiO2	(FAPbI3)0.95(MAPbBr3)0.05	one-step	spin 2-3	ethyl ether	DMF+DMSO	PDIF-BT	no	20.21
Cu2ZnSnS4 as an efficient hole transporting material for low temperature paintable carbon electrode based perovskite solar cells	2020	TiO2	mTiO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Cu2ZnSnS4	no	12.53
Air-processed carbon-based perovskite solar cells with enhanced efficiency and stability: Effect of temperature control and using CuSCN	2020	TiO2	mTiO2	FA0.83MA0.17PbI2$49Br0.51	one-step	spin 2-3	chlorobenzene	DMF+DMSO	CuSCN	no	14.87
High-performance hole conductor-free perovskite solar cell using a carbon nanotube counter electrode	2020	ZnO	PEI	MAPI3	one-step	spin	ethyl ether	DMF+DMSO	MWCNTs	no	15.56
Indium doped CsPbI3 films for inorganic perovskite solar cells with efficiency exceeding	2020	TiO2	no	InI3:CsPbI3	one-step	spin	no	DMF	Spiro-OMeTAD	Li+TBP	17.09

17%											
Critical Assessment of the Use of Excess Lead Iodide in Lead Halide Perovskite Solar Cells	2020	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.3
A perovskite solar cell owing very high stabilities and power conversion efficiencies	2020	bathophenanthroline	no	CsPbI3-[CsPbI3]0.04[(MAPbBr3)0.15(FAPbI3)0.85]0.96-CsPbI3	two-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	21.32
Universal defects elimination for high performance thermally evaporated CsPbBr3 perovskite solar cells	2020	TiO2	no	CsPbBr3	two-step	evaporation-spin	no	no	no	no	9.35
Tetrahydrofuran as Solvent for P3HT:F4-TCNQ Hole-Transporting Layer to Increase the Efficiency and Stability of FAPbI3-based Perovskite Solar Cell	2020	SnO2	no	(FAPbI3)0.875(CsPbBr3)0.125	one-step	spin	diethyl ether	DMF+DMSO	P3HT:F4-TCNQ	no	13.54
An Efficient and Stable Perovskite Solar Cell with Suppressed Defects by Employing Dithizone as a Lead Indicator	2020	SnO2	no	(Cs0.05FA0.54MA0.41)Pb(I0.98Br0.02)3	two-step	spin	no	DMF+DMSO+IPA	Spiro-OMeTAD	Li+TBP	20.36
Improving the open-circuit voltage of Sn-based perovskite solar cells by band alignment at the electron transport layer/perovskite layer interface	2020	SnO2	no	(MA,FA)Pb(I,Br)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA	Li+TBP	18

Improving the open-circuit voltage of Sn-based perovskite solar cells by band alignment at the electron transport layer/perovskite layer interface	2020	TiO2	no	(MA,FA)Pb(I,Br)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA	Li+TBP	16.9
Improving the open-circuit voltage of Sn-based perovskite solar cells by band alignment at the electron transport layer/perovskite layer interface	2020	Nb2O5	no	(MA,FA)Pb(I,Br)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA	Li+TBP	15.1
High-performance HTL-free perovskite solar cell: An efficient composition of ZnO NRs, RGO, and CuInS2QDs, as electron-transporting layer matrix	2020	ZnO-RGO5%-CuInS220%	no	MAPbI3	two-step	spin	no	DMF+IPA	no	no	15.74
Greatly enhanced power conversion efficiency of hole-transport-layer-free perovskite solar cell via coherent interfaces of perovskite and carbon layers	2020	TiO2	no	MAPbI3	one-step	spin	no	DMF	no	no	14.1
Implicit Tandem Organic–Inorganic Hybrid Perovskite Solar Cells Based on Internal Dye Sensitization: Robotized Screening, Synthesis, Device Implementation, and …	2020	TiO2	no	CsPbI3-Mn	one-step	spin	no	DMF+DMSO	PTAA	Li+TBP	16.52
Highly electroluminescent and stable inorganic CsPbI2Br perovskite solar cell enabled by balanced charge transfer	2020	SnO2:C60-EDA	no	CsPbI2Br-5-AVABr	one-step	spin 2-3	ethyl acetate	DMSO+IPA	Spiro-OMeTAD	Li+TBP	16.58
Highly electroluminescent and stable inorganic CsPbI2Br perovskite solar	2020	SnO2:C70-EDA	no	CsPbI2Br-5-AVABr	one-step	spin 2-3	ethyl acetate	DMSO+IPA	Spiro-OMeTAD	Li+TBP	15.66

cell enabled by balanced charge transfer											
Investigating the effects of carbon-based counter electrode layers on the efficiency of hole-transporter-free perovskite solar cells	2020	TiO2	mTiO2	MAPbI3	one-step	spin	no	DMF	no	no	4.25
Hysteresis-less and stable perovskite solar cells with a self-assembled monolayer	2020	SnO2-CPTA-SAM	no	CsFAMA	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	17.7
Benzodithiophene-Thienopyrroledione-Thienothiophene-based Random Co-polymeric Hole Transporting Material for Perovskite Solar Cell	2020	TiO2-Cl	mTiO2	Cs0.05((MA 0.15FA0.85)(0.95)Pb(I0.8 5Br0.15)3,	one-step	spin 2-3	chlorobenzene	DMF+DMSO	RCP-BTT	Li+TBP	14.57
Benzodithiophene-Thienopyrroledione-Thienothiophene-based Random Co-polymeric Hole Transporting Material for Perovskite Solar Cell	2020	TiO2-Cl	mTiO2	Cs0.05((MA 0.15FA0.85)(0.95)Pb(I0.8 5Br0.15)3,	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTB7	Li+TBP	12.02
Benzodithiophene-Thienopyrroledione-Thienothiophene-based Random Co-polymeric Hole Transporting Material for Perovskite Solar Cell	2020	TiO2-Cl	mTiO2	Cs0.05((MA 0.15FA0.85)(0.95)Pb(I0.8 5Br0.15)3,	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.17
Critical role of interface contact modulation in realizing low-temperature fabrication of efficient and stable CsPbIBr2perovskite solar cells	2020	SnO2	no	CsPbIBr2	one-step	spin 2-3	no	DMSO	Spiro-OMeTAD	Li+TBP+FK 209	10.81

Critical role of interface contact modulation in realizing low-temperature fabrication of efficient and stable CsPbIBr2perovskite solar cells	2020	ZnO	no	CsPbIBr2	one-step	spin 2-3	no	DMSO	Spiro-OMeTAD	Li+TBP+FK 209	9.7
Dual Effective Dopant Based Hole Transport Layer for Stable and Efficient Perovskite Solar Cells	2020	TiO2	mTiO2	PbI2,FAI,MA Br,PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+PFPPY	21.38
Dual Effective Dopant Based Hole Transport Layer for Stable and Efficient Perovskite Solar Cells	2020	TiO2	mTiO2	PbI2,FAI,MA Br,PbBr2	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	19.69
Vacuum-Assisted Growth of Low-Bandgap Thin Films (FA0.8MA0.2Sn0.5Pb0.5I3) for All-Perovskite T andem Solar Cells	2020	SnO2	no	(FA0.8MA0. 2Sn0.5Pb0.5 I3)	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	23
Improve the Oxide/Perovskite Heterojunction Contact for Low Temperature High Efficiency and Stable All-inorganic CsPbI2Br Perovskite Solar Cells	2020	ZnO	no	CsPbI2Br	one-step	spin	no	DMSO	Spiro-OMeTAD	Li+TBP+FK 209	14.78
Improve the Oxide/Perovskite Heterojunction Contact for Low Temperature High Efficiency and Stable All-inorganic CsPbI2Br Perovskite Solar Cells	2020	SnO2	no	CsPbI2Br	one-step	spin	no	DMSO	Spiro-OMeTAD	Li+TBP+FK 209	12.3
Alkyl Chain Regulated Charge Transfer in Fluorescent Inorganic CsPbBr3 Perovskite Solar Cells	2020	TiO2	mTiO2	CsPbBr3	two-step	spin	no	DMF	CuInS2/ZnS	no	10.85

Effective carbon composite electrode for low-cost perovskite solar cell with inorganic CuIn0.75Ga0.25S2 HTM	2020	TiO2	no	Cs0.05(MA0.17FA0.83)0.95Pb(I0.83Br0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	CuIn0.75Ga0.25S2	no	16.3
Effect of the hole transporting / active layer interface on the perovskite solar cell stability	2020	SnO2	no	MAPbI3-xClx	one-step	spin	no	DMF	PTAA	no	12.6
Effect of the hole transporting / active layer interface on the perovskite solar cell stability	2020	SnO2	no	MAPbI3-xClx	one-step	spin	no	DMF	P3HT	no	11.2
Moisture-Resistant FAPbI3 Perovskite Solar Cell with 22.25% Power Conversion Efficiency through Pentafluorobenzyl Phosphonic Acid Passivation	2020	TiO2	mTiO2	FAPbI3/PFBPA	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	22.25
Moisture-Resistant FAPbI3 Perovskite Solar Cell with 22.25% Power Conversion Efficiency through Pentafluorobenzyl Phosphonic Acid Passivation	2020	TiO2	mTiO2	FAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	20.19
Chlorine-modified SnO2electron transport layer for high-efficiency perovskite solar cells	2020	SnO2-Cl	no	FAI,PbI2,CsI,MABr,PbBr2	one-step	spin	anisole	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.01
Chlorine-modified SnO2electron transport layer for high-efficiency perovskite solar cells	2020	SnO2	no	FAI,PbI2,CsI,MABr,PbBr2	one-step	spin	anisole	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.81
Combustion Procedure Deposited SnO2 Electron Transport Layers for High Efficient	2020	s-SnO2	no	Cs 0.05 (MA 0.17 FA 0.83	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	15.29

Perovskite Solar Cells				)0.95 Pb(I 0.83 Br 0.17)3							
Combustion Procedure Deposited SnO2 Electron Transport Layers for High Efficient Perovskite Solar Cells	2020	c-SnO2	no	Cs 0.05 (MA 0.17 FA 0.83)0.95 Pb(I 0.83 Br 0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	19.12
Combustion Procedure Deposited SnO2 Electron Transport Layers for High Efficient Perovskite Solar Cells	2020	Nd-SnO2	no	Cs 0.05 (MA 0.17 FA 0.83)0.95 Pb(I 0.83 Br 0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PCBM	no	20.92
Introduction of Multifunctional Triphenylamino Derivatives at the Perovskite/ HTL Interface to Promote Efficiency and Stability of Perovskite Solar Cells	2020	SnO2-Cl	no	FAPbI3	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	16.69
Introduction of Multifunctional Triphenylamino Derivatives at the Perovskite/ HTL Interface to Promote Efficiency and Stability of Perovskite Solar Cells	2020	SnO2-Cl	no	FAPbI3	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP+TPA-EABr	17.4
Introduction of Multifunctional Triphenylamino Derivatives at the Perovskite/ HTL Interface to Promote Efficiency and Stability of Perovskite Solar Cells	2020	SnO2-Cl	no	FAPbI3	two-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP+TPA-PEABr	18.15
A highly stable hole-conductor-free CsxMA1-xPbI3perovskite solar cell	2020	TiO2	mTiO2-mZrO2	CsxMA1-xPbI3	one-step	spin 2-3	no	DMF+DMSO	no	no	10.57

based on carbon counter electrode											
Performance of low-cost mixed cationic carbon-based solar cells prepared through compositional engineering under ambient conditions	2020	TiO2	mTiO2-mZrO2	FA0.55MA0.25Cs0.2PbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	no	no	9.56
Performance of low-cost mixed cationic carbon-based solar cells prepared through compositional engineering under ambient conditions	2020	TiO2	mTiO2-mZrO2	FA0.55MA0.25Cs0.2PbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	P3HT	no	8.56
Performance of low-cost mixed cationic carbon-based solar cells prepared through compositional engineering under ambient conditions	2020	TiO2	mTiO2-mZrO2	FA0.55MA0.25Cs0.2PbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	no	13.41
Solvent selection for highly reproducible carbon-based mixed-cation hybrid lead halide perovskite solar cells via adduct approach	2020	TiO2	mTiO2-mZrO2	Cs0.1FA0.9PbI3	one-step	drip	no	DMSO	no	no	12.33
Solvent selection for highly reproducible carbon-based mixed-cation hybrid lead halide perovskite solar cells via adduct approach	2020	TiO2	mTiO2-mZrO2	Cs0.1FA0.9PbI3	one-step	drip	no	DMF+DMSO	no	no	10.06
Solvent selection for highly reproducible carbon-based mixed-cation hybrid lead halide perovskite solar cells via adduct approach	2020	TiO2	mTiO2-mZrO2	Cs0.1FA0.9PbI3	one-step	drip	no	DMF	no	no	8.07

Solvent selection for highly reproducible carbon-based mixed-cation hybrid lead halide perovskite solar cells via adduct approach	2020	TiO2	mTiO2-mZrO2	Cs0.1FA0.9PbI3	one-step	drip	no	DMSO+GBL	no	no	4.62
Paradoxical Approach with a Hydrophilic Passivation Layer for Moisture-Stable, 23% Efficient Perovskite Solar Cells	2020	SnO2	no	FAPbI3	one-step	spin	diethyl ether	DMF+NMP	Spiro-OMeTAD	Li+TBP	21.54
Paradoxical Approach with a Hydrophilic Passivation Layer for Moisture-Stable, 23% Efficient Perovskite Solar Cells	2020	SnO2	no	FAPbI3+4ABI	one-step	spin	diethyl ether	DMF+NMP	Spiro-OMeTAD	Li+TBP	23.25
Paradoxical Approach with a Hydrophilic Passivation Layer for Moisture-Stable, 23% Efficient Perovskite Solar Cells	2020	SnO2	no	FAPbI3+2AEI	one-step	spin	diethyl ether	DMF+NMP	Spiro-OMeTAD	Li+TBP	22.75
Multifunctional Enhancement for Highly Stable and Efficient Perovskite Solar Cells	2020	TiO2	no	FA0.85MA0.15PbI3	one-step	spin 2-3	chlorobenzene	DMF+NMP	Spiro-OMeTAD	Li+TBP	22.21
Thiocyanate assisted nucleation for high performance mix-cation perovskite solar cells with improved stability	2020	Bi-SnO2	no	FA0.4MA0.6PbI2.8-xBr0.2(SCN)x	one-step	spin	no	DMF	Spiro-OMeTAD	Li+TBP+FK209	19.64
Thiocyanate assisted nucleation for high performance mix-cation perovskite solar cells with improved stability	2020	Bi-SnO2	no	FA0.4MA0.6PbI2.8Br0.2	one-step	spin	no	DMF	Spiro-OMeTAD	Li+TBP+FK209	17.13
Inhibited aggregation of lithium salt in spiro-OMeTAD toward highly efficient perovskite solar cells	2020	TiO2	mTiO2	PbI2,FAI,MABr	two-step	spin	no	DMF+DMSO+IPA	Spiro-OMeTAD	Li+TBP	17.6

Inhibited aggregation of lithium salt in spiro-OMeTAD toward highly efficient perovskite solar cells	2020	TiO2	mTiO2	PbI2,FAI,MABr	two-step	spin	no	DMF+DMSO +IPA	Spiro-OMeTAD	Li+TBP+PbI2	20.3
Efficient defect-passivation and charge-transfer with interfacial organophosphorus ligand modification for enhanced performance of perovskite solar cells	2020	TiO2	mTiO2	Cs0.05FA0.79MA0.16Pb(I0.83Br0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.24
Efficient defect-passivation and charge-transfer with interfacial organophosphorus ligand modification for enhanced performance of perovskite solar cells	2020	TiO2	mTiO2	Cs0.05FA0.79MA0.16Pb(I0.83Br0.17)3	one-step	spin 2-3	chlorobenzene +TOPO	DMF+DMSO	Spiro-OMeTAD	Li+TBP	16.85
Efficient defect-passivation and charge-transfer with interfacial organophosphorus ligand modification for enhanced performance of perovskite solar cells	2020	TiO2	mTiO2	Cs0.05FA0.79MA0.16Pb(I0.83Br0.17)3	one-step	spin 2-3	chlorobenzene +TPPO	DMF+DMSO	Spiro-OMeTAD	Li+TBP	18.29
Dual-Protection Strategy for High-Efficiency and Stable CsPbI2Br Inorganic Perovskite Solar Cells	2020	SnO2	no	CsPbI2Br	one-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	12.17
Dual-Protection Strategy for High-Efficiency and Stable CsPbI2Br Inorganic Perovskite Solar Cells	2020	SnO2	no	BTSTh CsPbI2Br	one-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	15.58
Dual-Protection Strategy for High-Efficiency and Stable CsPbI2Br Inorganic Perovskite Solar Cells	2020	SnO2	no	STh CsPbI2Br	one-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	14.04
Dual-Protection Strategy for High-Efficiency and Stable CsPbI2Br Inorganic Perovskite Solar Cells	2020	SnO2	no	BT CsPbI2Br	one-step	spin	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	13.87

Effect of oxygen vacancies in the electron transfer layer SiZnSnO on the performance of perovskite solar cells	2020	Si-ZnSnO	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	13.4
Mesostructured perovskite solar cells based on Zn2SnO4 Single Crystal Mesoporous Layer with efficiency of 18.32%	2020	ZnO	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	10.77
Mesostructured perovskite solar cells based on Zn2SnO4 Single Crystal Mesoporous Layer with efficiency of 18.32%	2020	SnO2	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	16.9
Mesostructured perovskite solar cells based on Zn2SnO4 Single Crystal Mesoporous Layer with efficiency of 18.32%	2020	Zn2SnO4	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	14.34
Mesostructured perovskite solar cells based on Zn2SnO4 Single Crystal Mesoporous Layer with efficiency of 18.32%	2020	ZnSnO3	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	16.41
Mesostructured perovskite solar cells based on Zn2SnO4 Single Crystal Mesoporous Layer with efficiency of 18.32%	2020	Zn2Sn3O8	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	16
Mesostructured perovskite solar cells based on Zn2SnO4 Single Crystal Mesoporous Layer with efficiency of 18.32%	2020	ZnO	SnO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	17.54
Mesostructured perovskite solar cells based on Zn2SnO4 Single Crystal Mesoporous Layer with efficiency of 18.32%	2020	Zn2SnO4	SnO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	18.32
Mesostructured perovskite solar cells based on Zn2SnO4 Single Crystal Mesoporous Layer with efficiency of 18.32%	2020	ZnSnO3	SnO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	19.01

Mesostructured perovskite solar cells based on Zn2SnO4 Single Crystal Mesoporous Layer with efficiency of 18.32%	2020	Zn2Sn3O8	SnO2	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	18.1
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	TiO2	no	MAPbI3	one-step	spin 2-3	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	18.4
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	TiO2	PCBM	MAPbI3	one-step	spin 2-3	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.9
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	TiO2	NMBF-Cl dimer	MAPbI3	one-step	spin 2-3	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.9
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	TiO2	NMBF-H dimer	MAPbI3	one-step	spin 2-3	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3%	2020	TiO2	NMBF-Cl	MAPbI3	one-step	spin 2-3	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.6

Efficiency											
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	TiO2	NMBF-H	MAPbI3	one-step	spin 2-3	no	DMF+DMSO	Spiro-OMeTAD	Li+TBP	16.9
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	SnO2	no	(FAPbI3)x(MAPbBr3)1−x	two-step	spin	no	DMF+DMSO +IPA	Spiro-OMeTAD	Li+TBP	21.4
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	SnO2	PCBM	(FAPbI3)x(MAPbBr3)1−x	two-step	spin	no	DMF+DMSO +IPA	Spiro-OMeTAD	Li+TBP	20.8
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	SnO2	NMBF-Cl dimer	(FAPbI3)x(MAPbBr3)1−x	two-step	spin	no	DMF+DMSO +IPA	Spiro-OMeTAD	Li+TBP	22.3
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	SnO2	NMBF-H dimer	(FAPbI3)x(MAPbBr3)1−x	two-step	spin	no	DMF+DMSO +IPA	Spiro-OMeTAD	Li+TBP	21.3

Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	SnO2	NMBF-Cl	(FAPbI3)x(MAPbBr3)1−x	two-step	spin	no	DMF+DMSO +IPA	Spiro-OMeTAD	Li+TBP	20.7
Chlorinated Fullerene Dimers for Interfacial Engineering Toward Stable Planar Perovskite Solar Cells with 22.3% Efficiency	2020	SnO2	NMBF-H	(FAPbI3)x(MAPbBr3)1−x	two-step	spin	no	DMF+DMSO +IPA	Spiro-OMeTAD	Li+TBP	18.9
Multifunctional Phosphorus-Containing Lewis Acid and Base Passivation Enabling Efficient and Moisture-Stable Perovskite Solar Cells	2020	SnO2	no	Cs0.05FA0.8MA0.15Pb(I0.83Br0.17)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	18.05
Multifunctional Phosphorus-Containing Lewis Acid and Base Passivation Enabling Efficient and Moisture-Stable Perovskite Solar Cells	2020	SnO2	no	Cs0.05FA0.8MA0.15Pb(I0.83Br0.17)3-TPPO	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.1
Multifunctional Phosphorus-Containing Lewis Acid and Base Passivation Enabling Efficient and Moisture-Stable Perovskite Solar Cells	2020	SnO2	no	Cs0.05FA0.8MA0.15Pb(I0.83Br0.17)3-TMPP	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	19.13
Multifunctional Phosphorus-Containing Lewis Acid and	2020	SnO2	no	Cs0.05FA0.8MA0.15Pb(I0	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	21.04

Base Passivation Enabling Efficient and Moisture-Stable Perovskite Solar Cells				.83Br0.17)3-TPFP							
Graded 2D/3D Perovskite Heterostructure for Efficient and Operationally Stable MA-Free Perovskite Solar Cells	2020	SnO2	ZnO	FA0.95Cs0.05PbI3	one-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	19.1
Graded 2D/3D Perovskite Heterostructure for Efficient and Operationally Stable MA-Free Perovskite Solar Cells	2020	SnO2	ZnO	FA0.95Cs0.05PbI3-β-GUA	one-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	22.2
Graded 2D/3D Perovskite Heterostructure for Efficient and Operationally Stable MA-Free Perovskite Solar Cells	2020	SnO2	ZnO	FA0.95Cs0.05PbI3-5-AVAI	one-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	9
Graded 2D/3D Perovskite Heterostructure for Efficient and Operationally Stable MA-Free Perovskite Solar Cells	2020	SnO2	ZnO	FA0.95Cs0.05PbI3-GAI	one-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK209	20.02
Grain Boundary and Interface Passivation with Core–Shell Au@ CdS Nanospheres for High-Efficiency Perovskite Solar Cells	2020	SnO2 QD	no	(CsI)0.04(FAI)0.82(PbI2)0.86(MAPbBr3)0.14	one-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	17.71
Grain Boundary and Interface Passivation with Core–Shell Au@ CdS Nanospheres for High-Efficiency Perovskite Solar Cells	2020	SnO2 QD	no	(CsI)0.04(FAI)0.82(PbI2)0.86(MAPbBr3)0.14(Au@	one-step	spin	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	21.38

				CdS [20:15])							
Promoting the Efficiency and Stability of CsPbIBr2-Based All-Inorganic Perovskite Solar Cells through a Functional Cu2+Doping Strategy	2020	TiO2	no	CsPbIBr2	one-step	spin	no	DMSO	Spiro-OMeTAD	no	7.81
Promoting the Efficiency and Stability of CsPbIBr2-Based All-Inorganic Perovskite Solar Cells through a Functional Cu2+Doping Strategy	2020	TiO2	no	CsPbIBr2	one-step	spin	no	DMSO	Spiro-OMeTAD	no	10.4
Promoting the Efficiency and Stability of CsPbIBr2-Based All-Inorganic Perovskite Solar Cells through a Functional Cu2+Doping Strategy	2020	TiO2	no	CsPbIBr2	one-step	spin	no	DMSO	no	no	4.06
Promoting the Efficiency and Stability of CsPbIBr2-Based All-Inorganic Perovskite Solar Cells through a Functional Cu2+Doping Strategy	2020	TiO2	no	CsPbIBr2-0.50%Cu	one-step	spin	no	DMSO	no	no	7.93
Large-grain and smooth cesium doped CH3NH3PbI3perovskite films by cesium iodide post-treatment for improved solar cells	2020	TiO2	no	MAPbI3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	10.5

Large-grain and smooth cesium doped CH3NH3PbI3perovskite films by cesium iodide post-treatment for improved solar cells	2020	TiO2	no	MAPbI3-CsI	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP	15.3
Analysis of The Efficiency Losses in Hybrid Perovskite/PTAA Solar Cells with Different Molecular Weight: Morphology versus Kinetics.	2020	TiO2	no	(FA1-x-yMAxCsy)Pb(I1-xBrx)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA Low-MW	Li+TBP	15.67
Analysis of The Efficiency Losses in Hybrid Perovskite/PTAA Solar Cells with Different Molecular Weight: Morphology versus Kinetics.	2020	TiO2	no	(FA1-x-yMAxCsy)Pb(I1-xBrx)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA Medium-MW	Li+TBP	16.41
Analysis of The Efficiency Losses in Hybrid Perovskite/PTAA Solar Cells with Different Molecular Weight: Morphology versus Kinetics.	2020	TiO2	no	(FA1-x-yMAxCsy)Pb(I1-xBrx)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	PTAA High-MW	Li+TBP	18.65
Analysis of The Efficiency Losses in Hybrid Perovskite/PTAA Solar Cells with Different Molecular Weight: Morphology versus Kinetics.	2020	TiO2	no	(FA1-x-yMAxCsy)Pb(I1-xBrx)3	one-step	spin 2-3	chlorobenzene	DMF+DMSO	Spiro-OMeTAD	Li+TBP+FK 209	18.56

Table S2. Variables represented by “others” for the features in the first-step ML dataset.

Feature	Variables represented by “others”
ETL	2D titania, AZO, BaSnO3, BCP, Cd2SnO4, CdS, Cs2CO3, FPDI, graphene, IBF-Ep, IL, In2S3, ITIC, Nb2O5, NDI-graphene, P123-ib, PDI, PEIE, PEIE-LiQ, PFN ITOkısmına alsak mı, PFN-2TNDI, PS, PTEBS, TiZn2O4, WOx, Zn2SnO4, ZnS, α-Fe2O3
ETL-2	CdS-nanorod, Nb2O5, PCBA, mZn2SnO4, mZrO2, 2D-graphene, C3-SAM, CdS, ITIC, Msto, m-α-Fe2O3, PA-SAM, PCBB-2CN-2C8, PEI, PS, Rgs, SAM, ZGO, Au@SiO2, mSiO2

Deposition method	PLD, infiltration-dip, electrode position-dip, slot-die, blade-dip, Blowdry, Sprayroll, spin-MAK, MASP, spin-electrospray, dip-spin, Printed, Drip, spin-TSA, spin-OTA, spin-OSA, spin-contact, Dipping, Evap-spin, Spray, Vasp
Anti-solvent treatment	IPA, n-hexane, Methoxybenzene, diisopropyl ether, Ethanol, ethylacetate
Precursor solution	NEP, NMP, DMF+PVP, DMF+PEG, DMSO+SnF2, DMF+MACl, DMF+NH4Cl, DMF+HCl, DMF+HI, DMF+IPA, DMF+cyclohexane, DMF+HBr, DMF+H3PO2, DMF+PCBM, DMF+PCBM+PEG, DMF+Li, DMF+HI+HBr, DMF+graphene, DMF+MCN, DMF+CuPc(tBu)4, DMF+PDM Surea, DMF+Al, DMF+PAA, DMF+PEI, DMF+PEG, DMF+BAI, DMF+NH4I, DMF+NH4SCN, DMF+CNT, DMF+s-CNT, DMF+HAc, DMF+thiourea, DMF+H3P, DMF+4MSA, DMF+TBP, DMF+BMImI, DMF+DMSO+SnF2, DMF+DMSO+SnF2+pyrazine, DMF+DMSO+thiourea, DMF+DMSO+LiI, DMF+DMSO+2-pyridylthiourea, DMF+DMSO+NMP, DMF+DMSO+PVP, DMF+DMSO+KI, DMSO+GBL+CN, DMSO+GBL+HaHc, GBL+NMP, DMSO+SnF2
HTL	2TPA-2-DP, ACR-TPA, C5PcH2, carbon+MAI, CBP, Chl-1, Chl-2, Co3O4, CoPcNO2-Oph, copolymerP, Cu2O, CuI, CuInS2, CuInS2/ZnS, CuMePc, CuPc, CuPcNO2-Oph, PF8-TAA, PFB, PFO, Ph-TPM, PIF8-TAA, PNBA, POZ2, POZ3, PTB-BO, PTB-DCB21, PTZ1, PTZ2, PTZDPP-2, CZTS-QD, CZTSe-QD, DEH, DEPT-SC, DHPT-SC, DOPT-SC, DPA-TPM, DPIE, DPIO, DR3TBDTT, DR3TBDTT- PDMS, EH44, FA-CN, FDT, Fused-F, GO, H1no1, Triazine-Th-OMeTPA, TSHBC, TTF-1, V1no39, V885, V886, V911, V928, V931, V946, V957, V9no8, X51, Z25, HBZ-7no, HTM1, HTM2, JY5, KR122, KR131, KR133, KR145, KTM3, Me-BPZTPA, Me-QTPA, MEH-PPV, mNiO, NiOx, OMeTPA-FA, OMeTPA-TPA, P3DDT, Q222, RGO-1, RGO-2, RGO-3, Rno1, SGT-411, SGT-41no, SGT-4no9, SP-no1, SP-no1-Co, SP-no2, SWNT-GO, SYN1, Q221, P3DT, P3OT, PARA1, PBDTT-FTTE, PbS QDs, PCBM, PCBTDPP, PCDTBT, PCDTBT-PCPDTBT, PCPDTBT, PDI, PDPP3T, PDPPDBTE, PDTSTTz, PDTSTTz-4, Py-C, ZrO2, TFB, TiS2, TPA-CN, TPA-TPM, TPADPP-1, TPADPP-2, TPD, Triazine-Ph-OMeTPA, T1no1, T1no2, T1no3, Z26, ZnPcNO2-Oph, SWNT-PMMA
HTL additive	BuPyIm-TFSI, CuI, CuSCN, D-TBP, DIO, EH44-ox+TBP, F4TCNQ, graphene, H+TBP, H-TFSI+Et4N-TFSI, H-TFSI+Et4N-TFSI+Al2O3, Li, Li+D-TBP, spiro(TFSI)2+TBP, TBP, TFSI+TBP, Li+TBP+BPO, Li+TBP+Cu(bpcm), Li+TBP+FK269, Li+TBP+Ir, Li+TBP+MY11

Table S3. The ETL and ETL-2 materials with the top importance based on the RF classification model. α-Fe_2O_3 and WO_3 are classified into "others" for ETL while CdS is classified into "others" for ETL-2.

Material	Conduction band minimum /LUMO /[eV]	Fermi level /[eV]	Band gap /[eV]	Conductivity /[$S \cdot cm^{-1}$]	Electron mobility /[$cm^2 \cdot V^{-1}s^{-1}$]

ETL	TiO_2	~-4.2	~-4.55	~3.2-3.7	1.10×10^{-6} – 3.00×10^{-4}	1
	SnO_2	~-4.3	~-4.57	~3.6-4.1	1.76×10^{-6} – 1.77×10^{-1}	250
	α-Fe_2O_3	~-4.6	~-4.85	~2.1-2.2	2.40×10^{-7} – 1.54×10^{-5}	0.06
	WO_3	~4.2	~-5.02	~3.2-3.4	1.20×10^{-2}- 3.40×10^{-2}	~10 - 20
	ZnO	~-4.1	~-4.39	~3.2-3.4	/	200
	PCBM	~-4.0	~-5.04	~2.3	3.2×10^{-4}	2×10^{-3}
	C60	~-4.5	~-4.64	~1.7	2.3×10^{-3}	1.6
ETL-2	TiO_2	~-4.2	~-4.55	~3.2-3.7	1.10×10^{-6} - 3.00×10^{-4}	1
	CdS	~-3.8	~-4.1	~2.4	/	5
	PCBM	~-4.0	~-5.04	~2.3	3.2×10^{-4}	2×10^{-3}
	C60	~-4.5	~-4.64	~1.7	2.3×10^{-3}	1.6
	ZnO	~-4.1	~-4.39	~3.2-3.4	/	200

Table S4. Second-step ML dataset containing doped-TiO_2-based PSCs. The meaning of the features is atomic number (AN), ionic radius (IR/[pm]), ionic charge (IC), ionization energy (IE/[kJ·mol^{-1}]), electron affinity (EA/[kJ·mol^{-1}]), electronegativity (Pauling scales), electron numbers of s, p, d, f orbits and sum of s and p orbital radii (SP orbit/[pm]) which represent the properties of the

doping element. What's more features represent the optical and electrical properties of ETL after doping like and Fermi level (eV), CBM (eV), bandgap (eV) and conductivity ($S \cdot cm^{-1}$) were also selected. Features in the following Table have the same meaning.

Doping Element	AN	DA	CT	Gap	CBM	Fermi	IR	EN	SP orbital	S orbital	P orbital	D orbital	F orbital	IE	EA	IC	EIR
Nb	41	1	4.89E-06	3.02	-4.23	-4.41	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.0601
Nb	41	3	1.45E-05	2.70	-4.22	-4.20	62	1.6	181.9	9	18	14	0	652.13	86.1	5	0.9581
Nd	60	0.3	3.04E-05	2.60	-4.22	-4.34	112.3	1.14	221.8	12	24	20	4	533.08	60	3	1.0462
Nb	41	0.5	3.82E-05	3.26	-4.16	-4.11	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.0984
Nb	41	1	9.23E-06	3.25	-4.18	-4.26	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.0574
Nb	41	5	1.19E-05	3.17	-4.23	-4.15	62	1.6	181.9	9	18	14	0	652.13	86.1	5	0.7213
Ta	73	1	5.50E-06	3.45	-4.12	-4.25	78	1.5	170.9	12	24	23	14	728.42	31	5	0.9949
Ta	73	3	5.36E-06	3.35	-4.13	-4.39	78	1.5	170.9	12	24	23	14	728.42	31	5	1.0549
Ta	73	5	4.98E-06	3.33	-4.14	-4.45	78	1.5	170.9	12	24	23	14	728.42	31	5	1.0732
Ru	44	0.5	4.82E-05	3.65	-4.06	-4.61	82	2.2	164.7	9	18	17	0	710.18	101.3	3	1.0539
Ru	44	1	7.60E-05	3.65	-3.97	-5.45	82	2.2	164.7	9	18	17	0	710.18	101.3	3	1.2374
Ru	44	2	1.70E-05	3.63	-4.09	-4.66	82	2.2	164.7	9	18	17	0	710.18	101.3	3	0.8732
Ru	44	5	3.65E-05	3.62	-4.09	-4.58	82	2.2	164.7	9	18	17	0	710.18	101.3	3	0.5772
Mg	12	0.1	3.52E-05	3.44	-4.10	-3.48	71	1.31	136.9	6	6	0	0	737.75	0	2	1.3406
K	19	0.1	2.95E-05	2.98	-4.20	-3.76	151	0.82	230	7	12	0	0	418.81	48.3	1	1.0802
K	19	0.2	3.03E-05	2.99	-4.18	-3.82	151	0.82	230	7	12	0	0	418.81	48.3	1	1.1283
K	19	0.5	3.28E-05	3.43	-4.12	-3.01	151	0.82	230	7	12	0	0	418.81	48.3	1	0.9786
Co	27	0.3	4.04E-05	3.63	-4.00	-5.32	72	1.88	131.9	8	12	7	0	760.4	63.7	2	1.3873
Co	27	1	1.28E-05	2.38	-4.20	-4.57	72	1.88	131.9	8	12	7	0	760.4	63.7	2	1.0922
Co	27	2	1.30E-05	2.77	-4.21	-4.49	72	1.88	131.9	8	12	7	0	760.4	63.7	2	1.0526

Ag	47	1	5.00E-10	3.83	-2.33	-5.07	114	1.93	153.2	9	18	20	0	731	125.6	1	1.1379
Zn	30	1	5.50E-06	3.73	-4.05	-5.26	74	1.65	120	8	12	10	0	906.4	0	2	1.0442
Zn	30	3	1.57E-05	3.72	-4.02	-5.50	74	1.65	120	8	12	10	0	906.4	0	2	1.1239
Zn	30	5	8.34E-05	3.58	-4.05	-5.17	74	1.65	120	8	12	10	0	906.4	0	2	1.2389
Zn	30	7	2.20E-05	3.26	-4.19	-4.29	74	1.65	120	8	12	10	0	906.4	0	2	0.9823
Sn	50	3.5	2.18E-05	3.20	-4.13	-4.60	69	1.96	253.4	10	20	20	0	708.58	107.3	4	1.2932
Pt	78	0.76	5.96E-06	3.35	-3.99	-4.66	74	2.28	159.1	11	24	29	14	864.4	205.3	2	1.1331
Sm	62	0.3	3.13E-05	3.33	-4.10	-4.31	109.8	1.17	216.4	12	24	20	6	544.54	50	3	1.1046
B	5	2.18	1.81E-05	3.78	-4.06	-5.08	25	2.04	164.6	4	1	0	0	800.64	26.7	3	1.091
Co	27	5	3.95E-06	3.11	-4.17	-4.60	72	1.88	131.9	8	12	7	0	760.4	63.7	2	1.0969
Li	3	1.25	1.23E-05	3.12	-4.16	-3.39	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1.1669
Nb	41	1	4.30E-06	2.92	-4.18	-4.52	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.17
Nb	41	3	1.12E-05	2.83	-4.18	-4.67	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.2574
Nb	41	5	1.24E-05	2.90	-4.21	-4.46	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.1
Mg	12	5	5.10E-05	3.36	-4.08	-3.54	71	1.31	136.9	6	6	0	0	737.75	0	2	1.2118
Mg	12	10	1.84E-05	3.44	-4.10	-5.29	71	1.31	136.9	6	6	0	0	737.75	0	2	1.3406
Cs	55	4.77	2.89E-05	3.31	-4.16	-4.54	181	0.79	282.4	11	24	20	0	375.7	45.5	1	1.6379
Mg	12	5	3.55E-06	3.36	-4.12	-2.93	71	1.31	136.9	6	6	0	0	737.75	0	2	1.0346
Mg	12	10	2.64E-06	3.44	-4.07	-3.45	71	1.31	136.9	6	6	0	0	737.75	0	2	1.1089
F	9	1	4.47E-06	3.52	-4.09	-2.42	117	3.98	78.7	4	5	0	0	1681.05	328	-1	1.0128
F	9	3	5.45E-06	3.15	-4.12	-3.22	117	3.98	78.7	4	5	0	0	1681.05	328	-1	1.1136
F	9	5	6.03E-06	3.14	-4.13	-3.22	117	3.98	78.7	4	5	0	0	1681.05	328	-1	1.115
F	9	10	6.24E-06	3.40	-4.16	-2.28	117	3.98	78.7	4	5	0	0	1681.05	328	-1	0.8858
Sn	50	5	6.21E-06	3.45	-3.91	-3.64	69	1.96	253.4	10	20	20	0	708.58	107.3	4	1.176
Er	68	0.68	2.61E-05	3.37	-4.00	-4.19	103	1.24	203.1	12	24	20	12	589.3	50	3	1.1293
Ni	28	1	3.04E-06	3.46	-3.96	-3.97	69	1.91	127.6	8	12	8	0	737.14	112	2	1.1037

Nb	41	1	1.30E-05	3.22	-4.14	-4.14	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.022
Nb	41	5	1.27E-05	3.21	-4.23	-4.23	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.0934
Nb	41	10	1.58E-05	3.18	-4.23	-4.23	62	1.6	181.9	9	18	14	0	652.13	86.1	5	0.9341
Nb	41	20	1.65E-05	3.09	-4.40	-4.40	62	1.6	181.9	9	18	14	0	652.13	86.1	5	0.7802
Mg	12	4	3.74E-08	3.49	-4.07	-3.59	71	1.31	136.9	6	6	0	0	737.75	0	2	1.1761
Mg	12	5.5	2.85E-08	3.45	-4.08	-3.41	71	1.31	136.9	6	6	0	0	737.75	0	2	1.1051
Sn	50	1	1.78E-09	3.67	-3.84	-6.34	69	1.96	253.4	10	20	20	0	708.58	107.3	4	1.2743
Ag	47	1	3.65E-09	3.29	-4.07	-4.71	114	1.93	153.2	9	18	20	0	731	125.6	1	1.1875
Zn	30	1	3.65E-09	3.24	-4.10	-4.87	74	1.65	120	8	12	10	0	906.4	0	2	1.2589
Al	13	0.5	7.23E-05	3.12	-4.51	2.46	53	1.61	253.2	6	7	0	0	577.54	42.5	3	1.2228
Mg	12	0.5	4.04E-05	3.22	-4.36	2.41	71	1.31	136.9	6	6	0	0	737.75	0	2	1.0653
Er	68	3	1.07E-05	3.07	-4.16	-4.51	103	1.24	203.1	12	24	20	12	589.3	50	3	1.165
Ag	47	0.1	3.92E-05	3.71	-4.08	-4.86	114	1.93	153.2	9	18	20	0	731	125.6	1	1.0531
Ag	47	0.5	8.93E-05	3.71	-4.08	-4.65	114	1.93	153.2	9	18	20	0	731	125.6	1	1.0619
Ag	47	1	3.00E-04	3.72	-4.00	-5.55	114	1.93	153.2	9	18	20	0	731	125.6	1	1.2212
Ag	47	3	5.98E-05	3.72	-4.11	-4.69	114	1.93	153.2	9	18	20	0	731	125.6	1	0.354
Cd	48	5	3.31E-05	3.03	-4.19	-4.60	92	1.69	136.8	10	18	20	0	867.77	0	2	1.29
Ga	31	3	1.10E-06	3.59	-4.09	-4.99	61	1.81	245.8	8	13	10	0	578.84	28.9	3	1.0875
Ga	31	5	1.60E-06	3.51	-4.08	-4.74	61	1.81	245.8	8	13	10	0	578.84	28.9	3	1.1055
Ga	31	7	2.05E-06	3.28	-4.09	-4.75	61	1.81	245.8	8	13	10	0	578.84	28.9	3	1.1668
Ga	31	9	8.50E-07	3.52	-4.10	-4.70	61	1.81	245.8	8	13	10	0	578.84	28.9	3	1.07
Li	3	0.3	3.45E-05	3.10	-4.10	-2.89	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1.0885
Zn	30	1	3.36E-05	3.71	-4.10	-6.00	74	1.65	120	8	12	10	0	906.4	0	2	1.0769
Zn	30	3	4.24E-05	3.71	-4.05	-5.97	74	1.65	120	8	12	10	0	906.4	0	2	1.1692
Zn	30	5	9.34E-06	3.68	-3.92	-5.90	74	1.65	120	8	12	10	0	906.4	0	2	1.2923
Zn	30	7	2.30E-05	3.65	-3.80	-5.84	74	1.65	120	8	12	10	0	906.4	0	2	1.1846

Nb	41	6	1.43E-04	3.77	-3.82	-4.79	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.6404
Ce	58	2	1.09E-05	3.20	-4.14	-4.38	115	1.12	216.9	12	24	21	1	534.39	50	3	1.1149
Al	13	1	5.49E-05	3.00	-4.60	-4.90	53	1.61	253.2	6	7	0	0	577.54	42.5	3	1.2234
Er	68	0.5	3.57E-05	3.21	-4.12	-4.18	103	1.24	203.1	12	24	20	12	589.3	50	3	1.1274
Ru	44	0.1	2.96E-05	3.51	-4.11	-3.93	82	2.2	164.7	9	18	17	0	710.18	101.3	3	1.03
Ru	44	0.05	3.23E-05	3.53	-4.05	-4.57	82	2.2	164.7	9	18	17	0	710.18	101.3	3	1.1356
Ru	44	0.2	3.06E-05	3.48	-4.10	-4.04	82	2.2	164.7	9	18	17	0	710.18	101.3	3	1.0123
Ru	44	0.3	2.87E-05	3.41	-4.15	-4.04	82	2.2	164.7	9	18	17	0	710.18	101.3	3	0.946
Ce	58	0.3	5.46E-05	3.58	-4.18	-4.12	115	1.12	216.9	12	24	21	1	534.39	50	3	1.0756
Ta	73	0.05	2.11E-05	3.04	-4.22	-4.47	78	1.5	170.9	12	24	23	14	728.42	31	5	1.0424
Ta	73	0.1	2.34E-05	2.97	-4.24	-4.50	78	1.5	170.9	12	24	23	14	728.42	31	5	1.1016
Ta	73	0.15	3.00E-05	3.05	-4.21	-4.45	78	1.5	170.9	12	24	23	14	728.42	31	5	1.0735
Ta	73	0.2	4.33E-05	3.11	-4.20	-4.42	78	1.5	170.9	12	24	23	14	728.42	31	5	1.0395
Li	3	0.3	3.31E-05	3.07	-4.10	-2.89	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1.0885
Ru	44	1	1.17E-05	3.15	-3.80	-3.72	82	2.2	164.7	9	18	17	0	710.18	101.3	3	1.17
Nb	41	6	1.82E-05	3.79	-3.82	-3.82	62	1.6	181.9	9	18	14	0	652.13	86.1	5	0.9934
Ta	73	1	1.64E-06	3.58	-4.38	-3.80	78	1.5	170.9	12	24	23	14	728.42	31	5	0.9816
Ta	73	3	3.29E-06	3.55	-4.40	-5.04	78	1.5	170.9	12	24	23	14	728.42	31	5	1.3926
Ta	73	5	2.68E-06	3.47	-4.41	-3.70	78	1.5	170.9	12	24	23	14	728.42	31	5	0.9202
Cl	17	0.4	3.90E-06	3.76	-4.07	-3.97	167	3.16	144.4	6	11	0	0	1251.19	349	-1	1.0417
Ru	44	1.5	2.06E-05	3.49	-3.96	-3.14	82	2.2	164.7	9	18	17	0	710.18	101.3	3	1.3604
Zn	30	1	1.29E-05	3.07	-4.13	-4.52	74	1.65	120	8	12	10	0	906.4	0	2	1.0742
Zn	30	2.5	1.31E-05	3.08	-4.10	-4.56	74	1.65	120	8	12	10	0	906.4	0	2	1.0909
Zn	30	5	1.58E-05	3.04	-4.09	-4.37	74	1.65	120	8	12	10	0	906.4	0	2	0.8907

Table S5. Second-step ML dataset containing doped-SnO_2-based PSCs.

Doping Element	AN	DA	CT	Gap	CBM	Fermi	IR	EN	SP orbital	S orbital	P orbital	D orbital	F orbital	IE	EA	IC	EIR
Li	3	0.000	4.14E-05	3.95	-4.22	-4.70	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1

Li	3	0.017	9.10E-05	3.95	-4.35	-4.85	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1.163
Mo	42	0.000	3.62E-06	3.89	-4.25	-4.74	55	2.16	175.3	9	18	15	0	684.32	71.9	6	1
Mo	42	0.010	4.89E-06	3.89	-4.25	-4.54	55	2.16	175.3	9	18	15	0	684.32	71.9	6	1.242
Y	39	0.000	7.50E-06	3.65	-4.42	-5.19	104	1.22	189.1	10	18	11	0	599.87	20.6	3	1
Y	39	0.030	1.05E-05	3.70	-4.29	-5.11	104	1.22	189.1	10	18	11	0	599.87	20.6	3	1.319
Zn	30	0.000	2.44E-06	3.86	-4.28	-4.16	74	1.65	120	8	12	10	0	906.4	0	2	1
Zn	30	0.029	3.26E-06	3.86	-4.19	-4.12	74	1.65	120	8	12	10	0	906.4	0	2	1.161
Y	39	0.000	1.12E-02	3.65	-4.45	-5.25	104	1.22	189.1	10	18	11	0	599.87	20.6	3	1
Y	39	0.018	6.60E-04	3.70	-4.26	-5.19	104	1.22	189.1	10	18	11	0	599.87	20.6	3	1.145
Zr	40	0.000	6.70E-06	4.04	-4.15	-4.29	73	1.33	178.5	10	18	12	0	640.1	41.1	4	1
Zr	40	0.030	8.90E-06	4.07	-4.02	-4.18	73	1.33	178.5	10	18	12	0	640.1	41.1	4	1.106
Nb	41	0.000	5.89E-05	3.94	-4.18	-4.35	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1
Nb	41	0.003	1.68E-04	3.95	-4.16	-4.33	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.065
Nb	41	0.005	2.14E-05	3.95	-4.17	-4.37	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.161
Nb	41	0.008	2.50E-04	3.95	-4.15	-4.29	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.075
Nb	41	0.010	2.78E-04	3.95	-4.15	-4.28	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.04
Mg	12	0.000	1.77E-01	3.95	-4.31	-5.33	71	1.31	136.9	6	6	0	0	737.75	0	2	1
Mg	12	0.025	1.30E-02	3.76	-4.98	-5.45	71	1.31	136.9	6	6	0	0	737.75	0	2	1.518
Mg	12	0.050	1.79E-02	3.72	-4.73	-5.46	71	1.31	136.9	6	6	0	0	737.75	0	2	1.667
Mg	12	0.075	1.06E-02	3.70	-4.88	-5.47	71	1.31	136.9	6	6	0	0	737.75	0	2	1.887
Mg	12	0.100	1.04E-02	3.93	-4.85	-5.49	71	1.31	136.9	6	6	0	0	737.75	0	2	1.446
Mg	12	0.200	9.83E-03	3.95	-4.90	-5.50	71	1.31	136.9	6	6	0	0	737.75	0	2	1.381
La	57	0.000	1.49E-03	4.04	-4.09	-4.33	117.2	1.1	220.1	12	24	21	0	538.09	48	3	1
La	57	0.025	2.60E-03	4.05	-4.02	-4.31	117.2	1.1	220.1	12	24	21	0	538.09	48	3	1.199
La	57	0.050	2.61E-03	4.07	-3.94	-4.25	117.2	1.1	220.1	12	24	21	0	538.09	48	3	1.119
Li	3	0.000	1.25E-03	4.20	-4.20	-4.50	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1

Li	3	0.020	1.82E-03	4.19	-4.19	-4.49	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1.004
Mg	12	0.020	1.92E-03	4.17	-4.14	-4.98	71	1.31	136.9	6	6	0	0	737.75	0	2	1.087
Sb	51	0.020	1.70E-03	4.16	-4.04	-4.33	90	2.05	233.1	10	21	20	0	830.58	103.2	3	1.103
Sc	21	0.030	2.36E-05	3.95	-4.19	-5.03	88.5	1.36	171.6	8	12	1	0	633.09	18.1	3	1.164
Y	39	0.030	2.76E-05	3.95	-4.13	-5.01	104	1.22	189.1	10	18	11	0	599.87	20.6	3	1.199
La	57	0.030	2.26E-05	3.96	-4.25	-5.09	117.2	1.1	220.1	12	24	21	0	538.09	48	3	1.132
Ta	73	0.000	7.25E-03	3.70	-4.34	-4.60	78	1.5	170.9	12	24	23	14	728.42	31	5	1
Ta	73	0.051	6.54E-03	3.70	-4.52	-4.56	78	1.5	170.9	12	24	23	14	728.42	31	5	1.113
Nd	60	0.000	6.22E-03	4.00	-4.40	-4.64	112.3	1.14	221.8	12	24	20	4	533.08	60	3	1
Nd	60	0.050	8.99E-04	4.00	-4.14	-4.37	112.3	1.14	221.8	12	24	20	4	533.08	60	3	1.094
Nb	41	0.000	4.31E-03	4.11	-4.04	-4.03	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1
Nb	41	0.010	1.96E-03	4.08	-4.07	-4.17	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.053
Nb	41	0.020	1.95E-03	4.02	-4.13	-4.08	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.098
Nb	41	0.040	3.77E-03	4.00	-4.15	-3.93	62	1.6	181.9	9	18	14	0	652.13	86.1	5	1.022
Nb	41	0.080	3.90E-03	3.93	-4.22	-4.02	62	1.6	181.9	9	18	14	0	652.13	86.1	5	0.995
F	9	0.000	3.73E-04	3.87	-4.41	-4.61	117	3.98	78.7	4	5	0	0	1681.05	328	-1	1
F	9	0.100	5.34E-04	3.89	-4.33	-4.55	117	3.98	78.7	4	5	0	0	1681.05	328	-1	1.033
F	9	0.150	1.27E-03	3.91	-4.27	-4.48	117	3.98	78.7	4	5	0	0	1681.05	328	-1	1.068
F	9	0.200	3.72E-03	3.92	-4.15	-4.41	117	3.98	78.7	4	5	0	0	1681.05	328	-1	1.114
F	9	0.300	6.37E-04	3.91	-4.30	-4.53	117	3.98	78.7	4	5	0	0	1681.05	328	-1	0.995
F	9	0.500	2.65E-04	3.89	-4.27	-4.48	117	3.98	78.7	4	5	0	0	1681.05	328	-1	0.908
F	9	0.700	1.12E-04	3.89	-4.27	-4.55	117	3.98	78.7	4	5	0	0	1681.05	328	-1	0.822
F	9	1.000	7.35E-05	3.89	-4.27	-4.55	117	3.98	78.7	4	5	0	0	1681.05	328	-1	0.775
Al	13	0.000	9.49E-03	3.60	-4.40	-4.59	53	1.61	253.2	6	7	0	0	577.54	42.5	3	1
Al	13	0.050	2.21E-03	3.60	-4.40	-4.60	53	1.61	253.2	6	7	0	0	577.54	42.5	3	1.341
Ta	73	0.000	2.40E-03	3.92	-4.20	-4.36	78	1.5	170.9	12	24	23	14	728.42	31	5	1

Ta	73	0.010	4.72E-03	3.96	-4.19	-4.34	78	1.5	170.9	12	24	23	14	728.42	31	5	1.068
Ta	73	0.005	2.24E-03	3.93	-4.19	-4.35	78	1.5	170.9	12	24	23	14	728.42	31	5	1.018
Ta	73	0.020	2.66E-03	3.95	-4.17	-4.33	78	1.5	170.9	12	24	23	14	728.42	31	5	1.024
In	49	0.000	1.14E-03	3.91	-4.07	-4.39	76	1.78	281.8	10	19	20	0	558.3	28.9	3	1
In	49	0.050	9.56E-03	3.87	-4.24	-4.52	76	1.78	281.8	10	19	20	0	558.3	28.9	3	1.09
Sb	51	0.000	1.77E-05	3.76	-4.43	-4.72	90	2.05	233.1	10	21	20	0	830.58	103.2	3	1
Sb	51	0.050	2.64E-05	3.78	-4.54	-4.66	90	2.05	233.1	10	21	20	0	830.58	103.2	3	1.052
Mg	12	0.000	4.71E-02	3.71	-4.23	-4.97	71	1.31	136.9	6	6	0	0	737.75	0	2	1
Mg	12	0.050	1.95E-02	3.97	-4.89	-5.54	71	1.31	136.9	6	6	0	0	737.75	0	2	1.149
Li	3	0.000	2.54E-03	4.07	-4.22	-4.47	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1
Li	3	0.319	4.93E-03	4.04	-4.35	-4.67	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1.629
Ru	44	0.000	1.40E-05	3.72	-4.30	-5.35	82	2.2	164.7	9	18	17	0	710.18	101.3	3	1
Ru	44	0.020	2.70E-05	3.71	-4.03	-5.18	82	2.2	164.7	9	18	17	0	710.18	101.3	3	1.089
Bi	83	0.000	1.19E-02	3.48	-4.33	-4.10	117	2.02	250.5	12	27	30	14	72.95	91.2	3	1
Bi	83	0.055	5.04E-03	3.48	-4.14	-4.06	117	2.02	250.5	12	27	30	14	72.95	91.2	3	1.081
Al	13	0.010	3.10E-04	3.92	-3.91	-4.16	53	1.61	253.2	6	7	0	0	577.54	42.5	3	1.085
La	57	0.010	2.67E-03	3.89	-3.92	-4.18	117.2	1.1	220.1	12	24	21	0	538.09	48	3	1.082
K	19	0.000	6.27E-04	3.70	-4.05	-4.14	151	0.82	230	7	12	0	0	418.81	48.3	1	1
K	19	0.060	7.95E-04	3.70	-4.19	-4.23	151	0.82	230	7	12	0	0	418.81	48.3	1	1.099
Li	3	0.000	1.76E-06	4.00	-4.24	-4.64	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1
Li	3	0.001	1.37E-05	4.01	-4.21	-4.65	73	0.98	164.1	3	0	0	0	520.22	59.6	1	1.066
F	9	0.000	6.10E-04	3.83	-4.30	-4.48	117	3.98	78.7	4	5	0	0	1681.05	328	-1	1
F	9	0.111	1.02E-03	3.86	-4.20	-4.24	117	3.98	78.7	4	5	0	0	1681.05	328	-1	1.053
Zn	30	0.000	7.60E-06	4.51	-4.06	-5.57	74	1.65	120	8	12	10	0	906.4	0	2	1
Zn	30	0.030	1.05E-05	4.44	-3.85	-5.44	74	1.65	120	8	12	10	0	906.4	0	2	1.064
C	6	0.000	2.35E-04	4.01	-3.94	-4.25	29	2.55	129	4	2	0	0	1086.45	153.9	4	1

C	6	0.004	5.01E-04	4.01	-4.00	-4.04	29	2.55	129	4	2	0	0	1086.45	153.9	4	1.497
K	19	0.000	1.82E-04	4.05	-3.23	-3.90	151	0.82	230	7	12	0	0	418.81	48.3	1	1
K	19	0.054	4.48E-04	3.95	-3.34	-3.59	151	0.82	230	7	12	0	0	418.81	48.3	1	1.149
Rb	37	0.000	3.01E-06	3.78	-3.70	-3.90	166	0.82	249	9	18	10	0	403.3	46.9	1	1
Rb	37	0.035	4.26E-06	3.80	-3.75	-3.90	166	0.82	249	9	18	10	0	403.3	46.9	1	1.054
P	15	0.000	2.65E-03	3.90	-4.19	-4.27	31	2.19	181.5	6	9	0	0	1011.81	72	5	1
P	15	0.074	6.20E-04	3.88	-4.18	-4.25	31	2.19	181.5	6	9	0	0	1011.81	72	5	1.069
S	16	0.000	1.30E-02	3.97	-4.40	-4.48	26	2.58	160.6	6	10	0	0	999.59	200	6	1
S	16	0.011	1.07E-02	3.97	-4.32	-4.35	26	2.58	160.6	6	10	0	0	999.59	200	6	1.073
Sm	62	0.000	5.03E-03	3.68	-4.37	-4.46	109.8	1.17	216.4	12	24	20	6	544.54	50	3	1
Mg	12	0.000	3.36E-02	3.77	-4.31	-5.00	71	1.31	136.9	6	6	0	0	737.75	0	2	1

Table S6. Physcial and chemical properties of doping elements.

Dopant	AN	IR	EN	SP orbit	S orbit	P orbit	D orbit	F orbit	IE	EA	IC
Cs	55	181	0.79	282.4	11	24	20	0	375.7	45.5	1
Cl	17	167	3.16	144.4	6	11	0	0	1251.19	349	-1
Rb	37	166	0.82	249	9	18	10	0	403.3	46.9	1
K	19	151	0.82	230	7	12	0	0	418.81	48.3	1
La	57	117.2	1.1	220.1	12	24	21	0	538.09	48	3
Bi	83	117	2.02	250.5	12	27	30	14	72.95	91.2	3
F	9	117	3.98	78.7	4	5	0	0	1681.05	328	-1
Ce	58	115	1.12	216.9	12	24	21	1	534.39	50	3
Ag	47	114	1.93	153.2	9	18	20	0	731.00	125.6	1
Nd	60	112.3	1.14	221.8	12	24	20	4	533.08	60	3
Sm	62	109.8	1.17	216.4	12	24	20	6	544.54	50	3
Y	39	104	1.22	189.1	10	18	11	0	599.87	20.6	3
Er	68	103	1.24	203.1	12	24	20	12	589.3	50	3
Cd	48	92	1.69	136.8	10	18	20	0	867.77	0	2
Sb	51	90	2.05	233.1	10	21	20	0	830.58	103.2	3
Sc	21	88.5	1.36	171.6	8	12	1	0	633.09	18.1	3
Ru	44	82	2.2	164.7	9	18	17	0	710.18	101.3	3
Ta	73	78	1.5	170.9	12	24	23	14	728.42	31	5
Fe	26	77	1.83	136.6	8	12	6	0	762.47	15.7	2
In	49	76	1.78	281.8	10	19	20	0	558.3	28.9	3
Zn	30	74	1.65	120	8	12	10	0	906.40	0	2
Pt	78	74	2.28	159.1	11	24	29	14	864.4	205.3	2
Li	3	73	0.98	164.1	3	0	0	0	520.22	59.6	1
Zr	40	73	1.33	178.5	10	18	12	0	640.1	41.1	4
Co	27	72	1.88	131.9	8	12	7	0	760.4	63.7	2
Mg	12	71	1.31	136.9	6	6	0	0	737.75	0	2
Ni	28	69	1.91	127.6	8	12	8	0	737.14	112	2
Sn	50	69	1.96	253.4	10	20	20	0	708.58	107.3	4
Nb	41	62	1.6	181.9	9	18	14	0	652.13	86.1	5
Ga	31	61	1.81	245.8	8	13	10	0	578.84	28.9	3
Ti	22	56	1.54	162.2	8	12	2	0	658.81	7.6	4
Mo	42	55	2.16	175.3	9	18	15	0	684.32	71.9	6
Al	13	53	1.61	253.2	6	7	0	0	577.54	42.5	3
P	15	31	2.19	181.5	6	9	0	0	1011.81	72	5
C	6	29	2.55	129	4	2	0	0	1086.45	153.9	4
N	7	27	3.04	106.2	4	3	0	0	1402.33	7	5
S	16	26	2.58	160.6	6	10	0	0	999.59	200	6
B	5	25	2.04	164.6	4	1	0	0	800.64	26.7	3

Following is the code of the classification in the first-step ML:

```
from sklearn.tree import DecisionTreeClassifier
from sklearn.tree import ExtraTreeClassifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.ensemble import AdaBoostClassifier
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.metrics import accuracy_score
from xgboost.sklearn import XGBClassifier
from sklearn.model_selection import train_test_split
from sklearn.neural_network import MLPClassifier
from sklearn.multiclass import OneVsRestClassifier
from sklearn import svm
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np

features = pd.read_excel('xxx.xlsx')# “xxx” is the file of your dataset
features = pd.get_dummies(features)
features.to_excel('one-hot-data.xlsx')
labels = np.array(features['label'])
features = features.drop('label', axis=1)
classes = ['0', '1', '2']# Class A, Class B, Class C

x_train, x_test, y_train, y_test = train_test_split(features, labels, test_size=0.20, random_state=42)
models = [DecisionTreeClassifier(), ExtraTreeClassifier(), RandomForestClassifier(),
AdaBoostClassifier(),
          GradientBoostingClassifier(), XGBClassifier(), MLPClassifier(),
          OneVsRestClassifier(svm.SVC())]
#
# models_str = ['DecisionTree', 'ExtraTree', 'RandomForest', 'AdaBoost',
#                'GradientBoost', 'XGBoost', 'MLPClassifier', 'SVM']

Tree = ['DecisionTree', 'ExtraTree', 'RandomForest', 'AdaBoost', 'GradientBoost', 'XGBoost']
linear_neural = ['MLPClassifier', 'SVM']
result = pd.DataFrame(columns=('model', 'dataset', 'accuracy', 'accuracy(%)'))
ETL = ['ETL_BCP', 'ETL_C60', 'ETL_PCBM', 'ETL_PEDOT:PSS', 'ETL_SnO2', 'ETL_TiO2',
'ETL_ZnO', 'ETL_no', 'ETL_others',
       'ETL-2_Al2O3', 'ETL-2_C60', 'ETL-2_PCBM', 'ETL-2_TiO2', 'ETL-2_ZnO', 'ETL-2_no',
'ETL-2_others']
```

```
model_jude = pd.DataFrame()
classifiers = [
                    ['DecisionTree', DecisionTreeClassifier(random_state=42, max_depth=15)],
                    ['ExtraTree', ExtraTreeClassifier(random_state=42, max_depth=13)],
                    ['RandomForest', RandomForestClassifier(random_state=42, max_depth=14)],
                    ['AdaBoost', AdaBoostClassifier(random_state=42)],
                    ['GradientBoost', GradientBoostingClassifier(random_state=42, max_depth=13)],
                    ['XGBoost', XGBClassifier(random_state=42, max_depth=13)],
                    ['MLPClassifier', MLPClassifier(solver='lbfgs', alpha=1e-5,
                                                    hidden_layer_sizes=(15,                15),
random_state=42, max_iter=100)],
                    ['SVM',        OneVsRestClassifier(svm.SVC(kernel='poly',        probability=True,
random_state=42))]
                   ]

for name, pipeline in classifiers:
        model = pipeline.fit(x_train, y_train)
        predictions_train = model.predict(x_train)
        predictions_test = model.predict(x_test)
        accracy_train = round(accuracy_score(y_true=y_train, y_pred=predictions_train),4)
        accracy_test = round(accuracy_score(y_true=y_test, y_pred=predictions_test), 4)
        print(str(name)+"train_Accuracy:", accracy_train)
        print(str(name)+"test_Accuracy:", accracy_test)
```