

Supporting Information

Enhancing the triiodide reduction activity of a perovskite-based electrocatalyst for dye-sensitized solar cells through exsolved silver nanoparticles

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Supplementary Figures

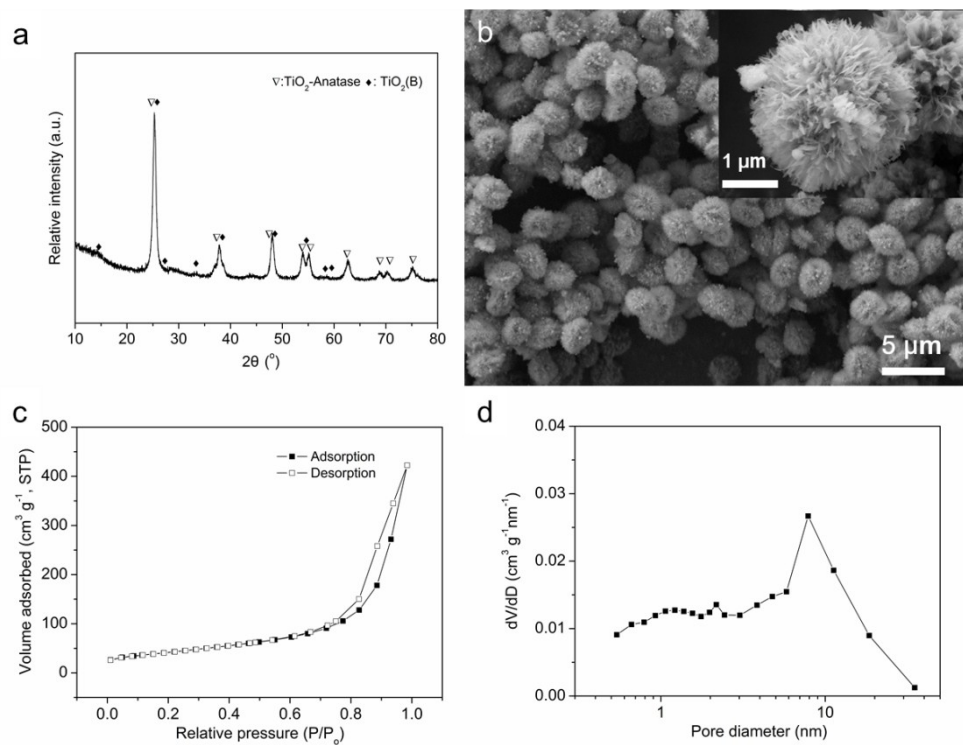


Fig. S1 (a) XRD pattern, (b) SEM images, (c) nitrogen adsorption/desorption isotherm pattern and (d) BJH pore size distribution curve of the porous TiO₂ microspheres.

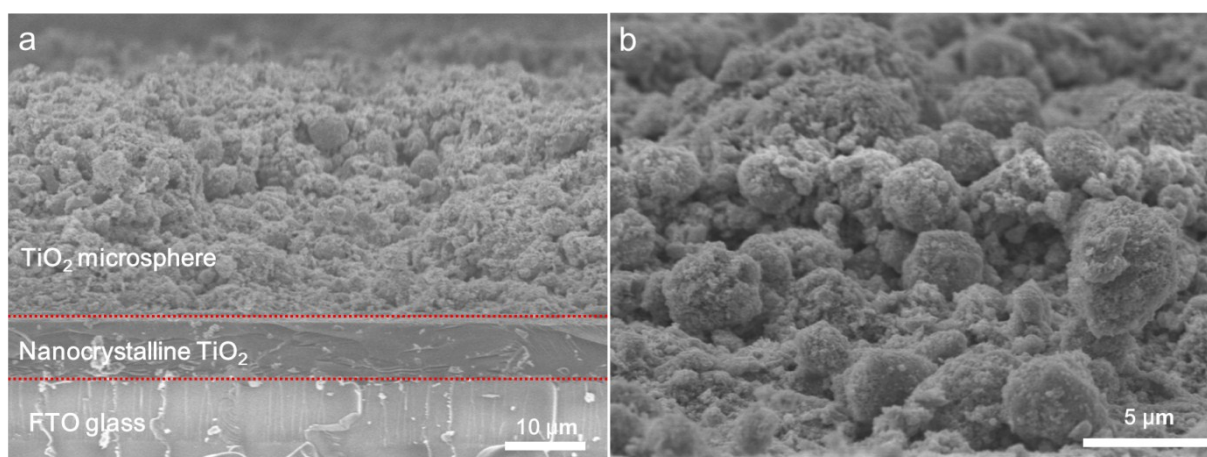


Fig. S2 Cross-sectional SEM images of (a) the nanocrystalline TiO₂ layer and TiO₂ microsphere layer on FTO glass and (b) the TiO₂ microsphere layer.

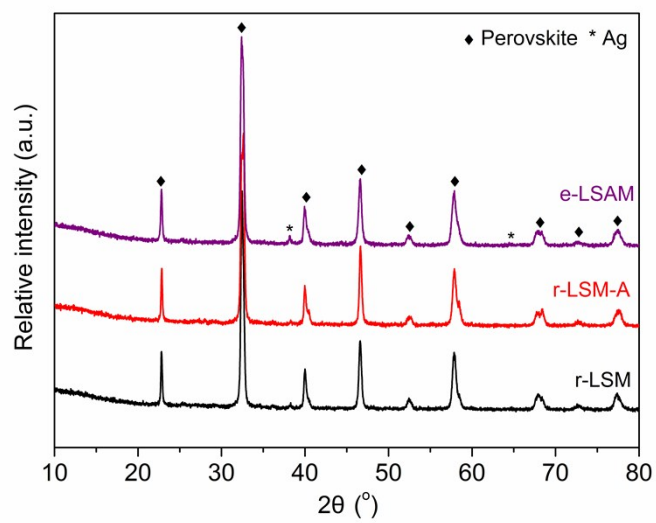


Fig. S3 XRD patterns of r-LSM, r-LSM-A and e-LSAM.

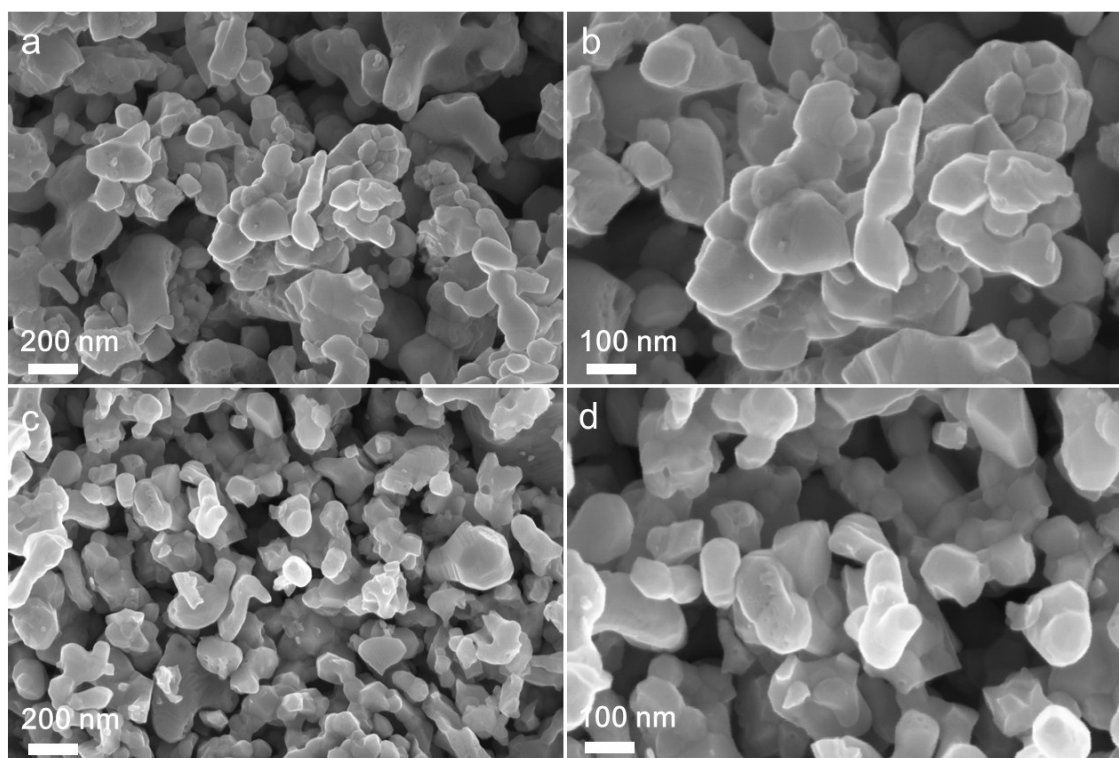


Fig. S4 SEM images of (a, b) r-LSM and (c, d) r-LSM-A.

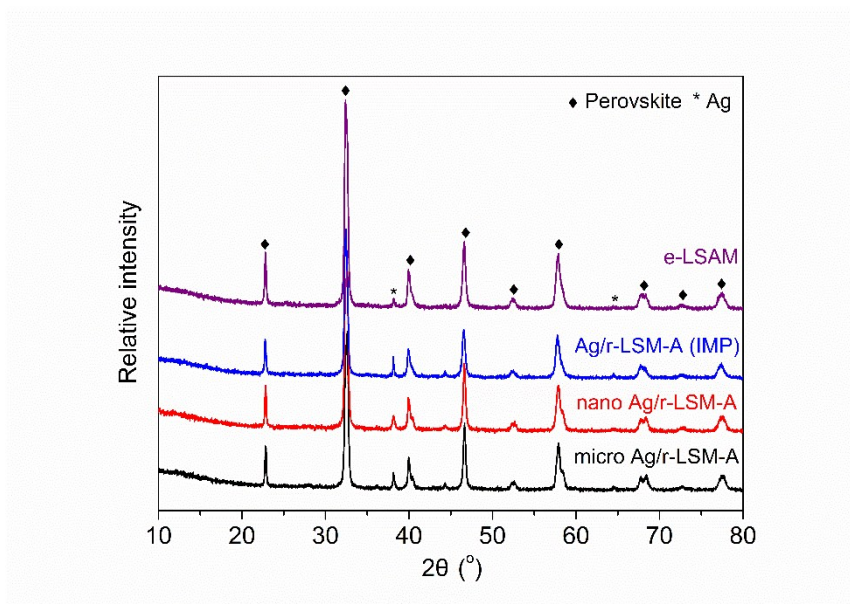


Fig. S5 XRD patterns of micro Ag/r-LSM-A, nano Ag/r-LSM-A, Ag/r-LSM-A (IMP) and e-LSAM.

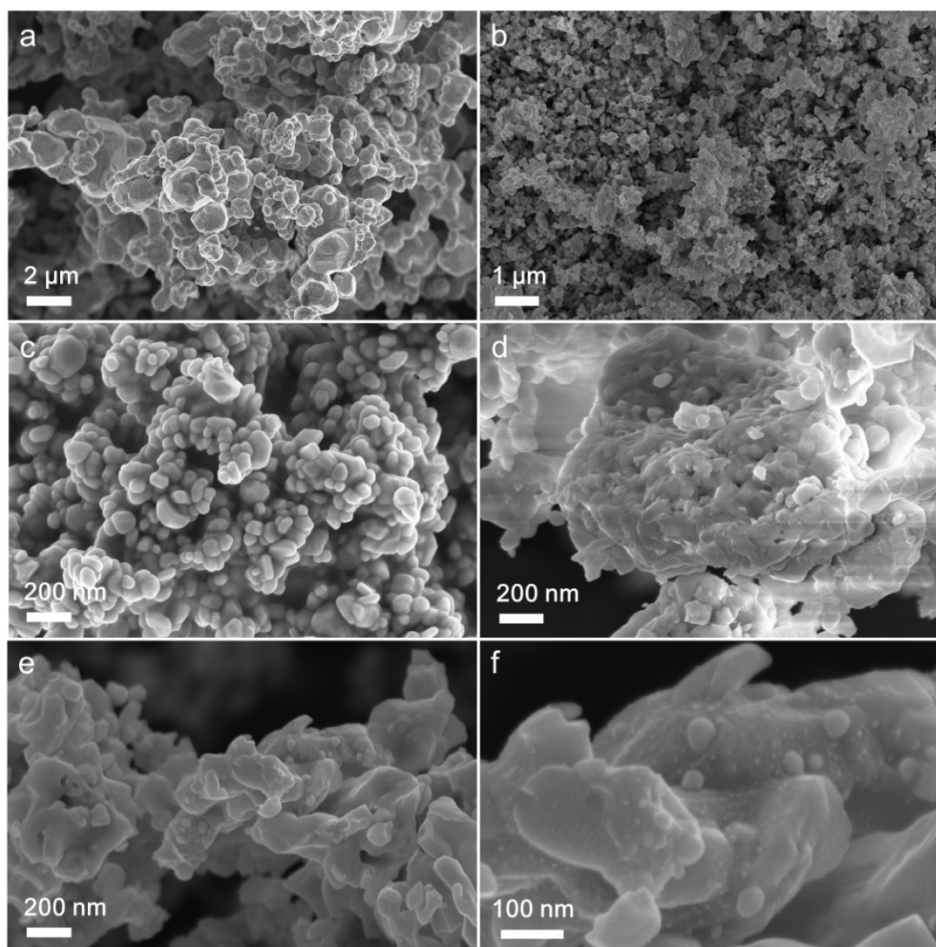


Fig. S6 SEM images of (a) commercial micro Ag, (b) micro Ag/r-LSM-A, (c) commercial nano Ag, (d) nano Ag/r-LSM-A and (e, f) Ag/r-LSM-A (IMP).

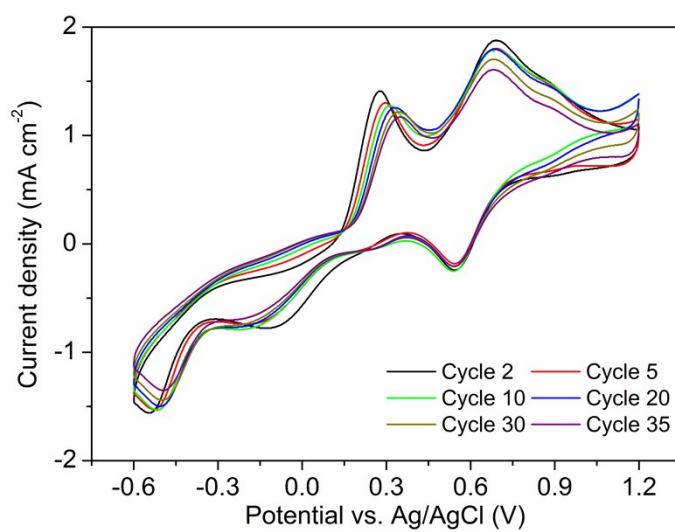


Fig. S7 The CV curves of Pt cathode in CV stability test.

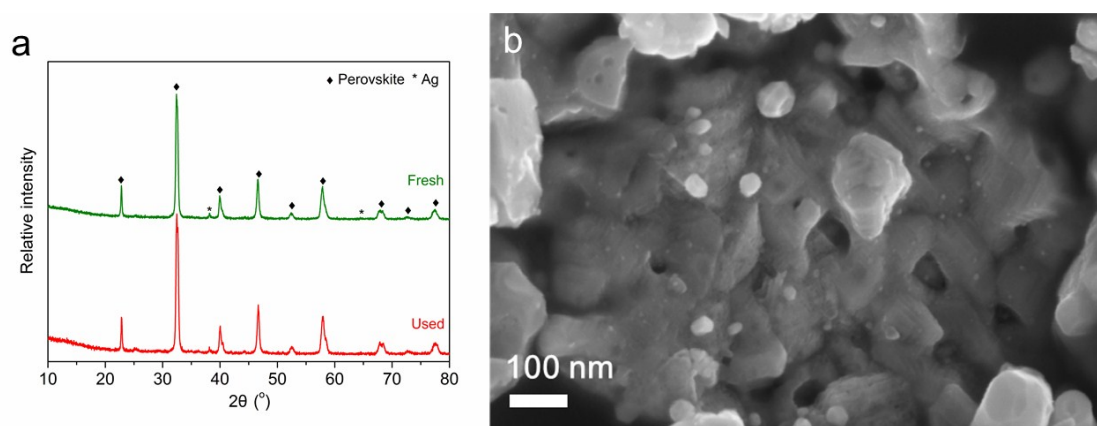


Fig. S8 (a) XRD patterns of e-LSAM cathode before and after the test. (b) SEM image of e-LSAM cathode after the test.

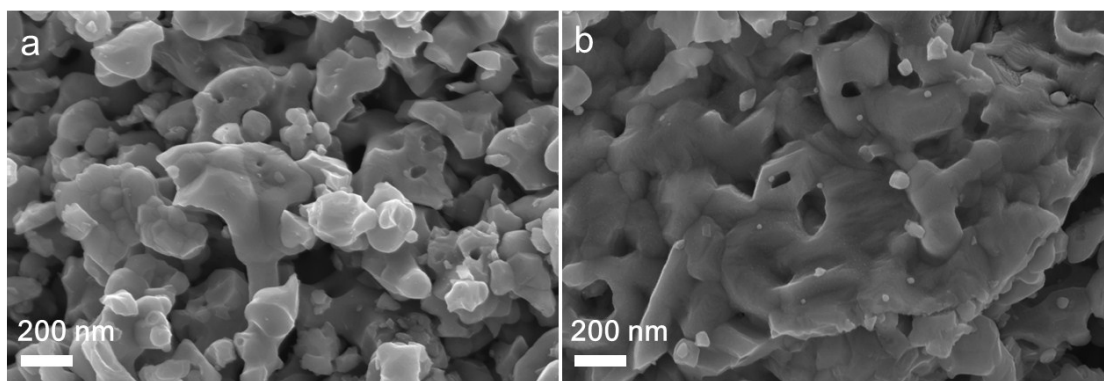


Fig. S9 SEM images of (a) LCAM and (b) e-LCAM.

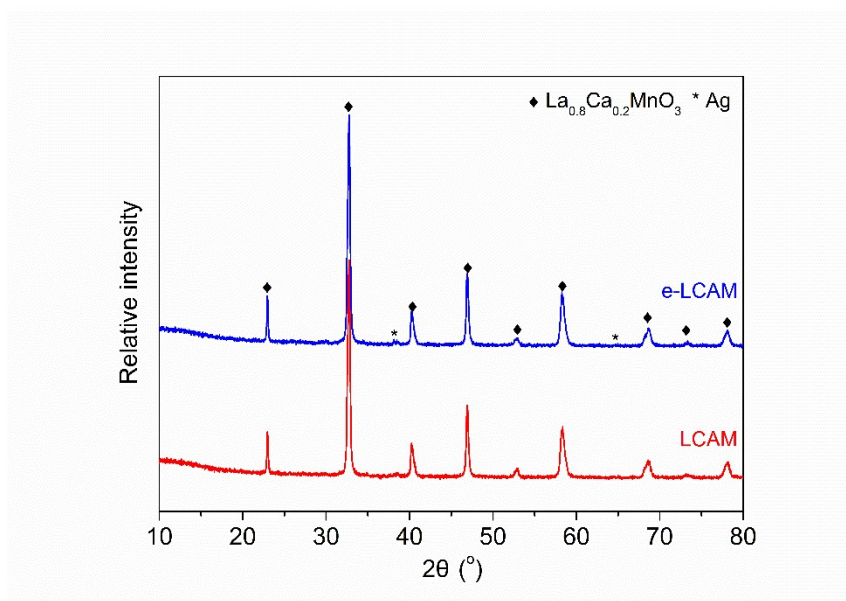


Fig. S10 XRD patterns of LCAM and e-LCAM.

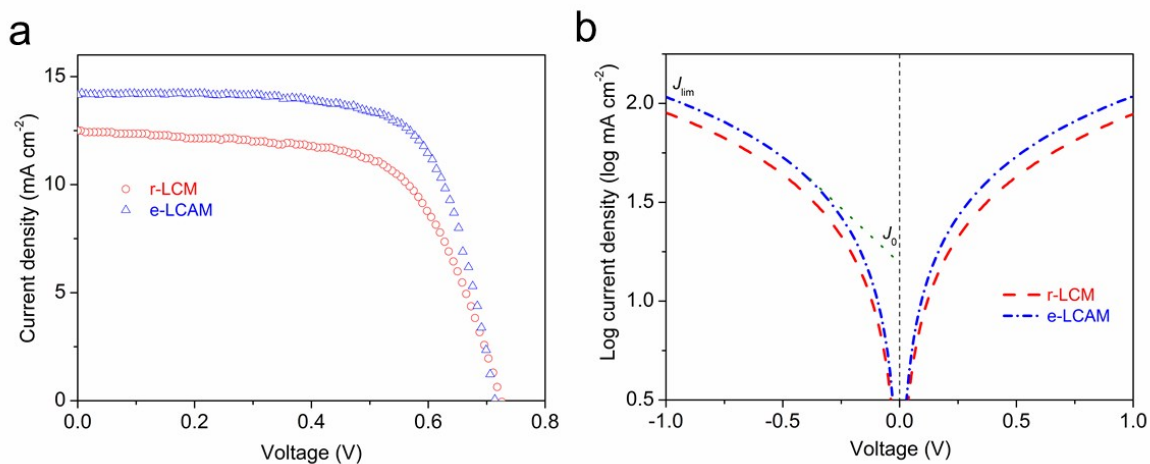


Fig. S11 (a) J - V curves of DSSCs with r-LCM and e-LCAM cathodes, TiO₂ microsphere photoanode, N719 dye under simulated sunlight irradiation. (b) Tafel curves of r-LCM and e-LCAM samples.

Supplementary Tables

Table S1 J - V characteristics of DSSCs with r-LSM, r-LSM-A, e-LSAM and Pt cathodes and TiO₂ microsphere photoanode and N719 dye under simulated sunlight irradiation.

Cathodes	J_{SC} (mA cm ⁻²)	V_{OC} (V)	FF	Maximum PCE (%)	Average PCE obtained by at least 5 cells (%)
r-LSM	12.6	0.709	0.581	5.20	5.04
r-LSM-A	13.7	0.732	0.597	5.99	5.97
e-LSAM	16.1	0.713	0.713	8.16	8.08
Pt	18.6	0.700	0.676	8.80	8.72

Table S2 Some important parameters obtained from the Tafel curves of r-LSM, r-LSM-A, e-LSAM and Pt in I₃⁻/I⁻-based electrolyte.

Cathodes	J_0 (mA cm ⁻²)	$R_{ct-Tafel}$ (Ω cm ²)	J_{lim} (mA cm ⁻²)	D (10 ⁻⁵ cm ² s ⁻¹)
r-LSM	10.2	1.25	82.8	2.07
r-LSM-A	12.4	1.02	93.5	2.34
e-LSAM	17.4	0.73	123.4	3.08
Pt	19.9	0.64	134.5	3.36

Table S3 J - V characteristics of DSSCs with micro Ag/r-LSM-A, nano Ag/r-LSM-A, Ag/LSM-A-IMP and e-LSAM cathodes and TiO₂ microsphere photoanode and N719 dye under simulated sunlight irradiation.

Cathodes	J _{SC} (mA cm ⁻²)	V _{OC} (V)	FF	Maximum PCE (%)	Average PCE obtained by at least 5 cells (%)
micro Ag/r-LSM-A	14.1	0.702	0.639	6.32	6.28
nano Ag/r-LSM-A	13.7	0.731	0.670	6.75	6.61
Ag/r-LSM-A (IMP)	14.3	0.729	0.699	7.29	7.21
e-LSAM	16.1	0.713	0.713	8.16	8.08

Table S4 Some important parameters obtained from the Tafel curves of r-LSM, r-LCM, e-LSAM and e-LCAM in I₃⁻/I⁻-based electrolyte.

Cathodes	J ₀ (mA cm ⁻²)	R _{ct-Tafel} (Ω cm ²)	J _{lim} (mA cm ⁻²)	D (10 ⁻⁵ cm ² s ⁻¹)
micro Ag/r-LSM-A	12.6	1.01	99.7	2.49
nano Ag/r-LSM-A	14.1	0.90	105.6	2.63
Ag/r-LSM-A (IMP)	15.8	0.80	112.9	2.82
e-LSAM	17.4	0.73	123.4	3.08

Table S5 J - V characteristics of DSSCs with LSAM/MWCNTs, e-LSAM/MWCNTs and Pt cathodes and TiO₂ microsphere photoanode and N719 dye under simulated sunlight irradiation.

Cathodes	J _{SC} (mA cm ⁻²)	V _{OC} (V)	FF	Maximum PCE (%)	Average PCE obtained by at least 5 cells (%)
LSAM/MWCNTs	15.7	0.765	0.700	8.41	8.27
e-LSAM/MWCNTs	18.7	0.769	0.740	10.7	10.6
Pt	18.6	0.700	0.676	8.80	8.72

Table S6 Some important parameters obtained from the Tafel curves and EIS spectra of LSAM/MWCNTs, e-LSAM/MWCNTs and Pt cathodes in I_3^-/I^- -based electrolyte.

Cathodes	J_0 (mA cm ⁻²)	$R_{ct-Tafel}$ (Ω cm ²)	J_{lim} (mA cm ⁻²)	D (10^{-5} cm ² s ⁻¹)	R_{ct-EIS} (Ω cm ²)
LSAM/MWCNTs	19.5	0.65	127.7	3.19	0.96
e-LSAM/MWCNTs	25.1	0.51	162.1	4.05	0.65
Pt	19.9	0.64	134.5	3.36	0.88

Table S7 $J-V$ characteristics of DSSCs with e-LSAM/MWCNTs and Pt cathodes, TiO₂ microsphere photoanode and C101 dye under simulated sunlight irradiation.

Cathodes	J_{SC} (mA cm ⁻²)	V_{OC} (V)	FF	Maximum PCE (%)	Average PCE obtained by at least 5 cells (%)
e-LSAM/MWCNTs	20.9	0.782	0.758	12.4	12.2
Pt	20.9	0.704	0.674	9.93	9.88

Table S8 $J-V$ characteristics of DSSCs with r-LCM and e-LCAM as cathodes and TiO₂ microsphere photoanode and N719 dye under simulated sunlight irradiation.

Cathodes	J_{SC} (mA cm ⁻²)	V_{OC} (V)	FF	Maximum PCE (%)	Average PCE obtained by at least 5 cells (%)
r-LCM	12.5	0.726	0.634	5.73	5.67
e-LCAM	14.2	0.714	0.699	7.09	6.86

Table S9 Some important parameters obtained from the Tafel curves of r-LCM and e-LCAM in I_3^-/I^- -based electrolyte.

Cathodes	J_0 (mA cm ⁻²)	$R_{ct-Tafel}$ (Ω cm ²)	J_{lim} (mA cm ⁻²)	D (10^{-5} cm ² s ⁻¹)
r-LCM	12.0	1.06	89.7	2.24
e-LCAM	15.1	0.84	107.9	2.69