Electronic Supplementary Material (ESI) for RSC Advances.

All-vacuum deposited perovskite solar cells with glycine modified NiO_x hole-transport layer

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Keywords: *All-vacuum deposition; perovskite solar cell; nickel oxide; glycine*

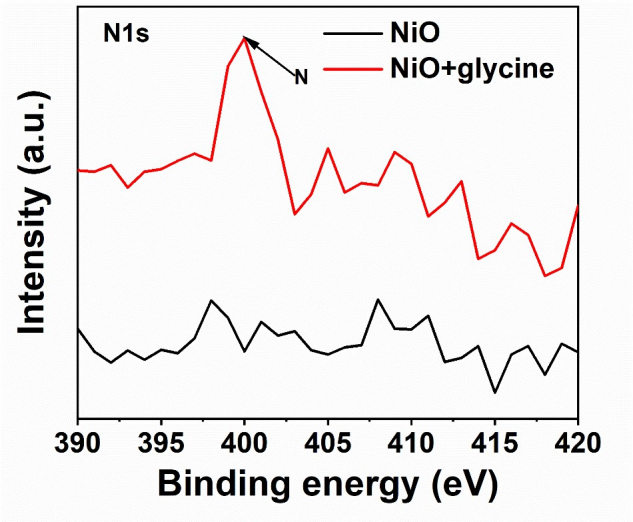

Figure S1. XPS high resolution spectra of the N1s.

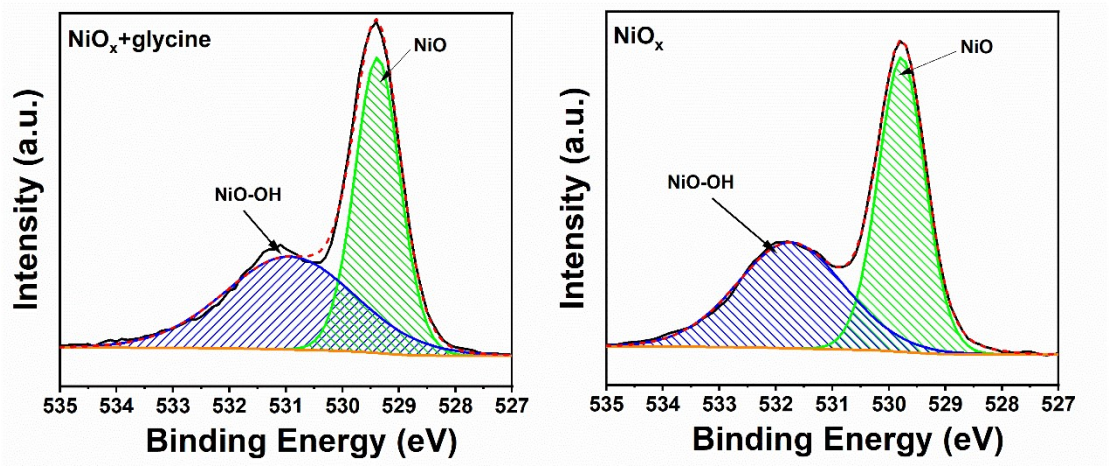

Figure S2. XPS spectra of O1s peak for NiO_x+glycine and NiO_x films.

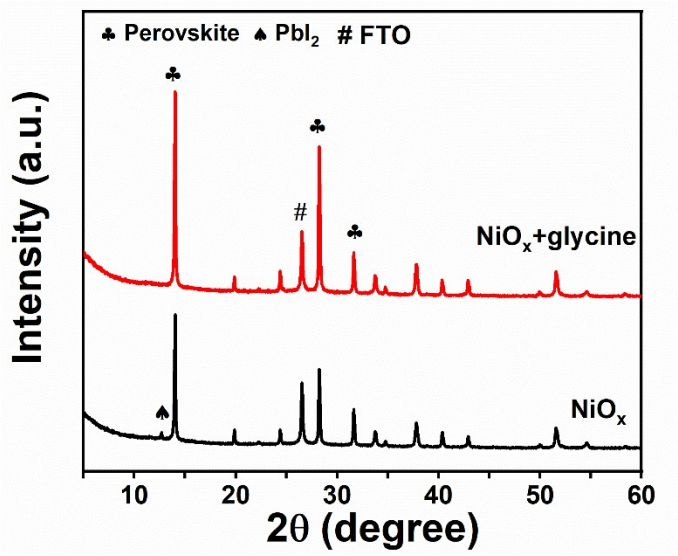

Figure S3. XRD patterns of perovskite films grown on NiO_x+glycine and NiO_x films.

Table S1. Contact angles of the NiO_x films with different immersion time in glycine solution.

Immersion time (min)	Contact angle (°)	
	left	right
0	23.75	21.33
30	32.86	32.66
60	47.22	47.91
90	69.70	63.93
120	69.61	67.94
150	67.81	65.55

Table S2. Fitted parameters of the TRPL spectra.

Substrate	A_1	τ_1(ns)	A_2	τ_2(ns)
NiO_x	526	58	756	174
NiO_x+glycine	332	37	933	214

Table S3. PCE of devices based on different preparation methods and modified materials

HTL Deposition Routes	Perovskite	Treatment of materials	PCE(%)(w/wo)	Year	Ref
sol–gel	$CH_3NH_3PbI_{3-x}Cl_x$	Ethanolamine molecules (EDA)	15.70/11.47	2016	[1]
Spin NiO_x NPs	$MAPbI_3$	para-substituted benzoic acid	18.4/15.3	2017	[2]
Solution(Cu:NiO_x)	$MAPbI_3$	Cysteine (Cys)	17.8/14.4	2018	[3]
Solution	$MAPbI_3$	n-Butylamine	18.9/13.2	2019	[4]
Solution	CsFAMA mixed	2,2'-bipyridine(/2,2'-BiPy)	15.86/16.53	2019	[5]
Sputter	$Cs_{0.05}(FA_{0.83}MA_{0.17})_{0.95}Pb(I_{0.82}Br_{0.18})_3$	[2-(3,6-dimethoxy-9H-carbazol-9-yl)ethyl]phosphonic acid (MeO-2PACz)	19.9/17.9	2021	[6]
Spin-coating NiO_x NPs	CsFAMA mixed	3-(Triethoxysilyl)propylamine (TSPA)	20.21/18.71	2021	[7]
spin-coating NiO_x NPs	$MAPbI_3$	trimethylolpropane tris(2-methyl-1-aziridinepropionate) (SaC-100)	19.29/17.54	2021	[8]
Sputter	$Cs_{0.05}MA_{0.15}FA_{0.80}Pb(I_{0.85}Br_{0.15})_3$	organometallic dye molecule (N719)	19.2/16.7	2021	[9]
Sputter	$MAPbI_3$	\	15.7	2021	[10]
Sputter	$MAPbI_3$	\	15.6	2021	[11]
E-beam	$MAPbI_3$	\	15.4	2018	[12]
E-beam	$MAPbI_3$ (Co-evaporation)	\	15.6	2019	[13]
E-beam	$Cs_{0.14}FA_{0.86}Pb(Br_xI_{1-x})_3$ (Vapor-solid reaction)	glycine	17.96/15.27	2022	This work

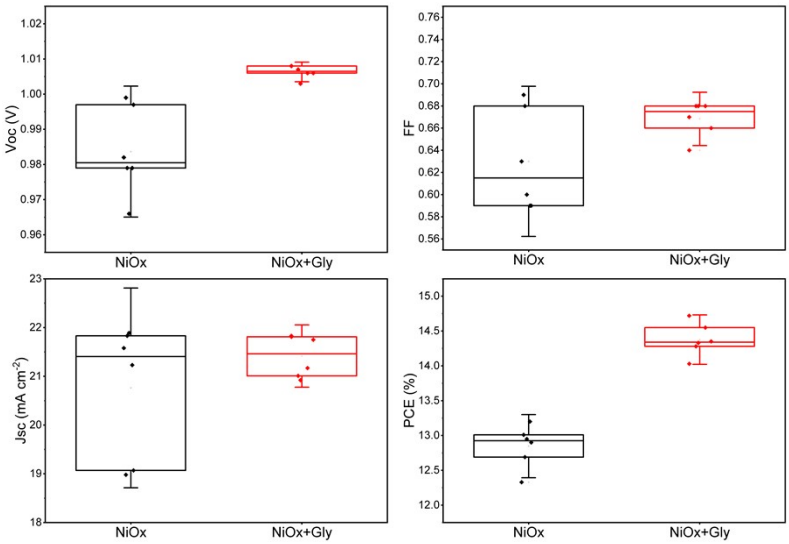

Fig S4. Statistical results of the *J-V* parameters of devices based on NiO_x and NiO_x+glycine films.

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