Electronic Supplementary Information

Evolution of Charge Pathways Through Amorphous Aluminum-Cerium Electrode for Stable Organic Photovoltaics

*Jae Sang Cho[a], Woongsik Jang[b], Keum Hwan Park[c], and Dong Hwan Wang[a,b]**

[a]Department of Intelligent Semiconductor Engineering, Chung-Ang University, 84 Heukseok-ro, Dongjak-gu, Seoul 06974, Republic of Korea

[b]School of Integrative Engineering, Chung-Ang University, 84 Heukseok-ro, Dongjak-gu, Seoul 06974, Republic of Korea

[c]Display Research Center Korea Electronics Technology Institute 25 Saenari-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13509, Republic of Korea

* Corresponding author, E-mail address: king0401@cau.ac.kr (Prof. D.H. Wang)

Table S1 Summary of electrical parameters of OPV devices with crystalline Al and amorphous AlCe electrodes before and after agining in ambient air for 24 hours.

	V_{oc} (V)	J_{sc} (mA/cm^2)	$J_{sc, EQE}$ (mA/cm^2)	FF	PCE (%)
Ag (Pristine)	0.928	17.21	19.79	0.63	10.06
Ag (24 h)	0.718	3.92	-	0.28	0.79
AlCe (Pristine)	1.026	16.95	17.02	0.57	9.92
AlCe (24 h)	1.121	18.06	17.27	0.50	10.03

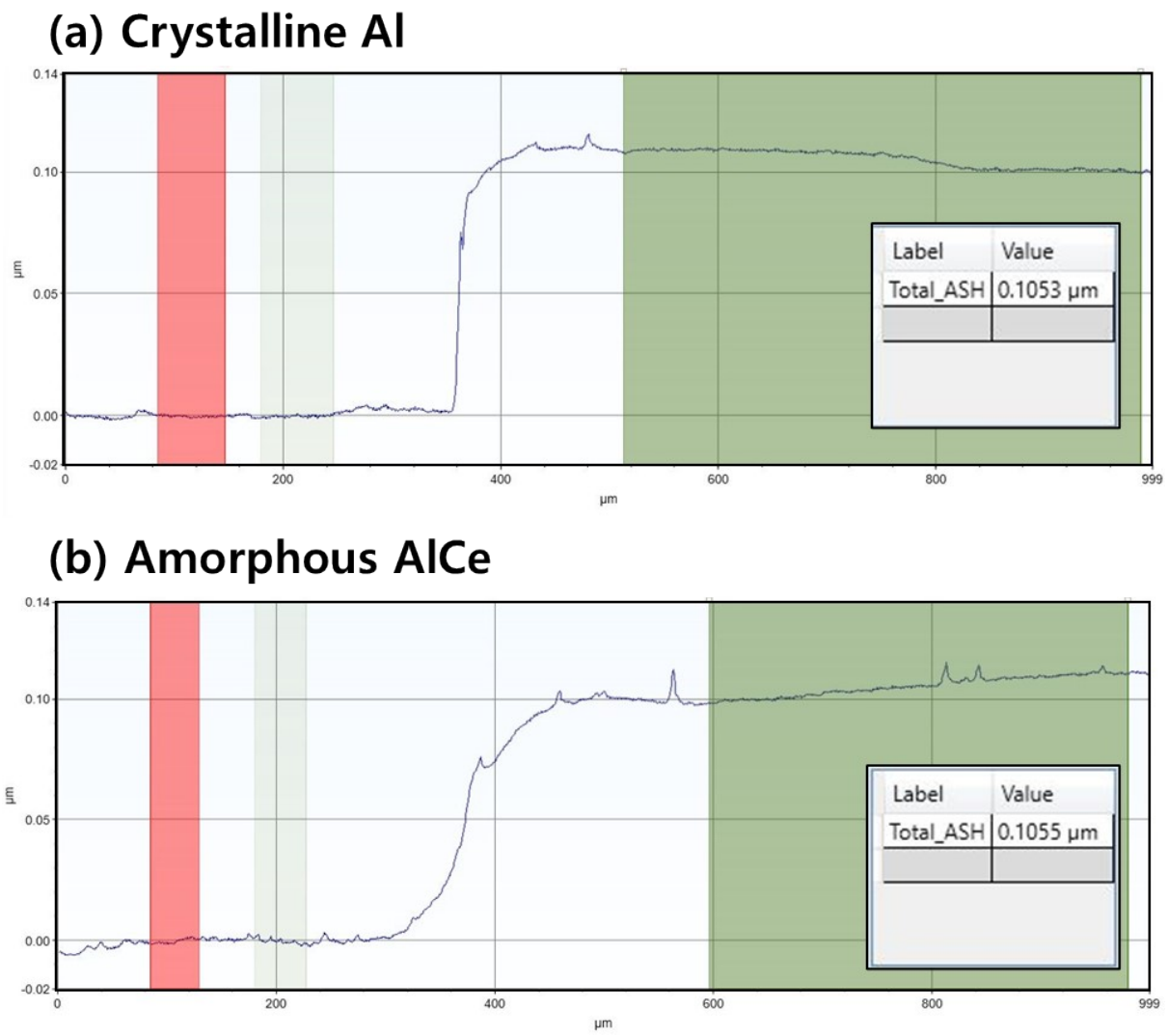

Fig. S1 Thickness measurement of sputtered crystalline Al and amorphous AlCe thin films with Alpha-step surface profiler showing that the electrodes with thicknesses of 100nm were obtained.

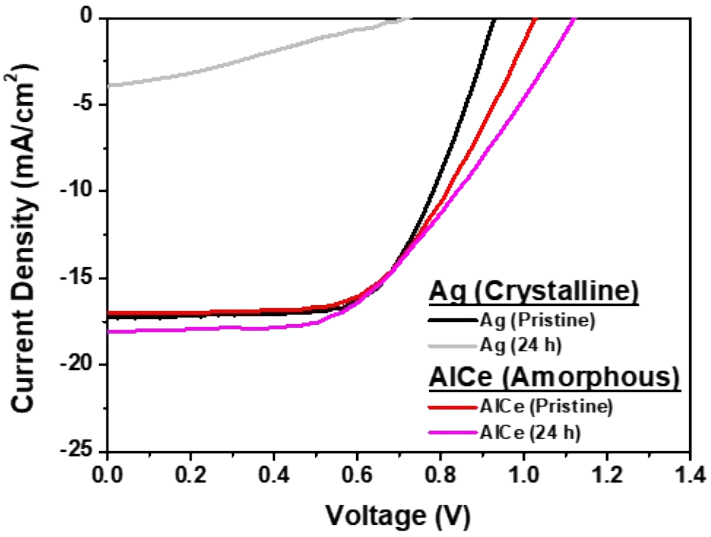

Fig. S2 J-V curves obtained from OPV devices with Ag and AlCe electrode, with current density (y-axis) in linear scale.

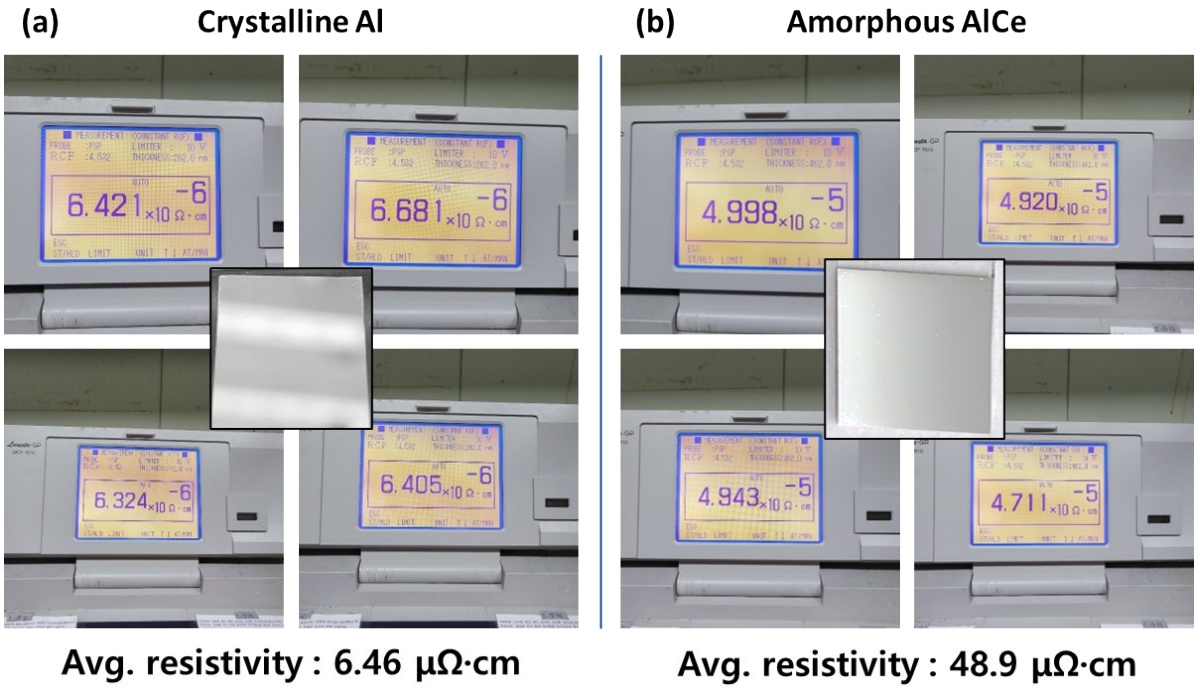

Fig. S3 Resistivity measurements of (a) crystalline Al and (b) amorphous AlCe electrode

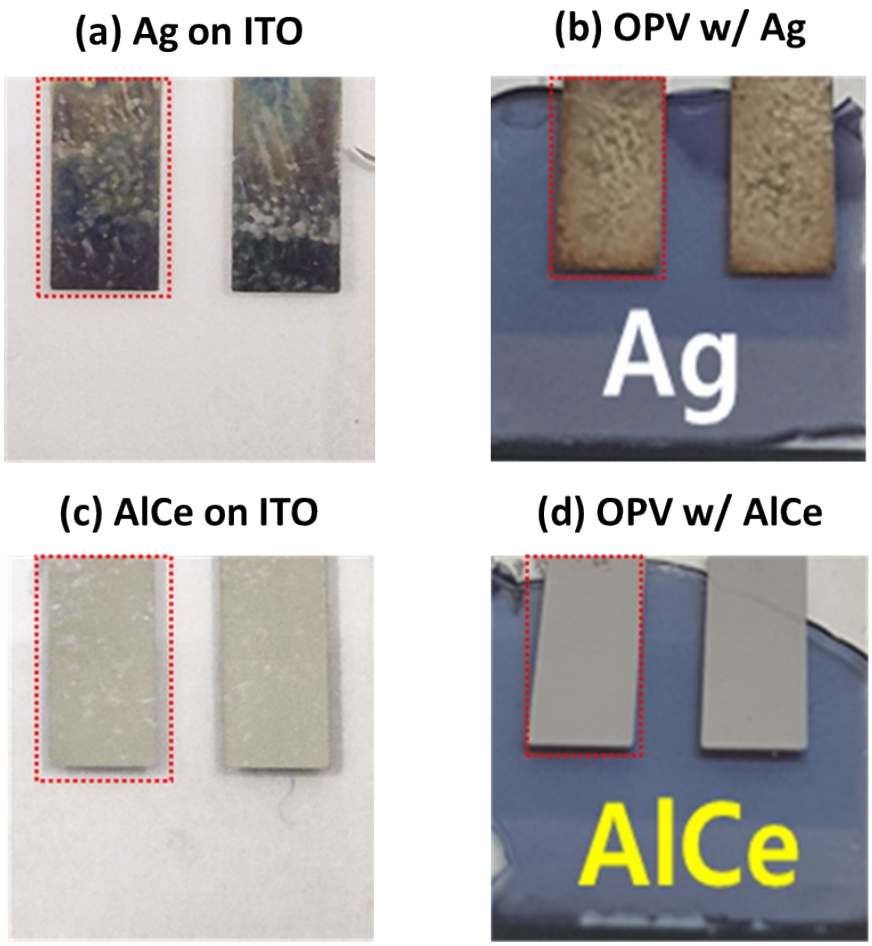

Fig. S4 Photographs of electrodes after storage in air for 1000 h. (a) Ag on ITO substrate, (b) Ag on OPV structure, (ITO/ZnO/PCE10:IEICO-4F/MoO_x) (c) AlCe on ITO substrate, and (d) AlCe on OPV structure

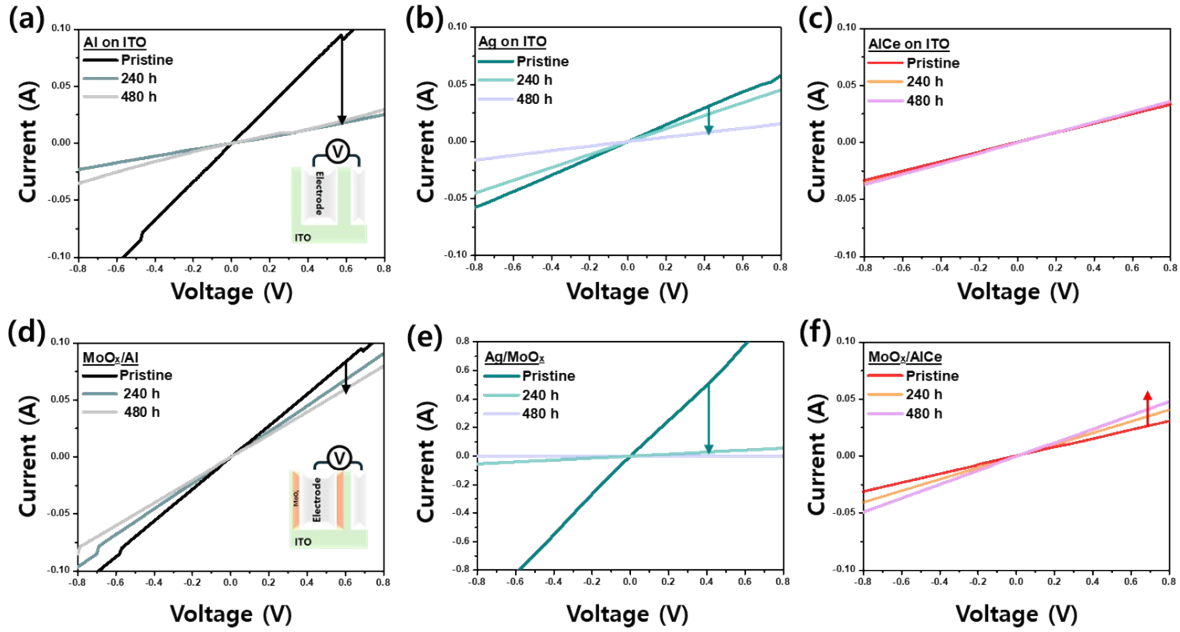

Fig. S5 I-V analyses on electronic conductivity at the interface between the electrodes (Al, Ag, and AlCe) and ITO (a, b, c) and the electrodes and MoOx layer (d, e, f) during storage in ambient air. The inset shows the sample structure used for the analyses.