Supplement Information

Effect of UV-Ozone Irradiation on Copper Doped Nickel acetate and Its Applicability to Perovskite Solar Cells

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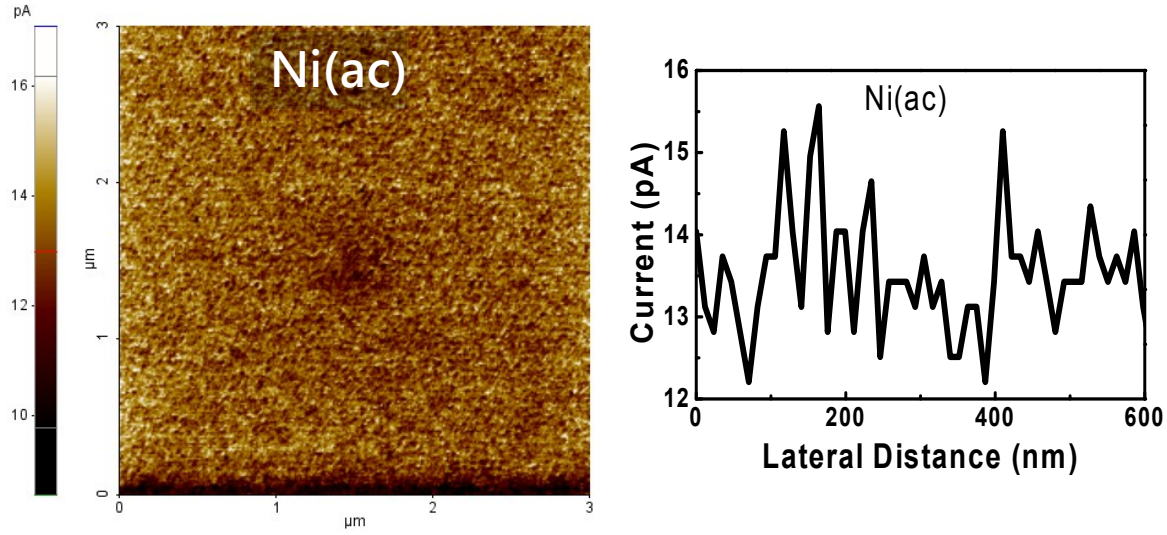

Figure S1. Conductive atomic force microscopy(C-AFM) images (3μm × 3μm) of Ni(ac) at V_{bias} = 0.1 V. [Current profiles are obtained from horizontal lines at y axis of 1μm]

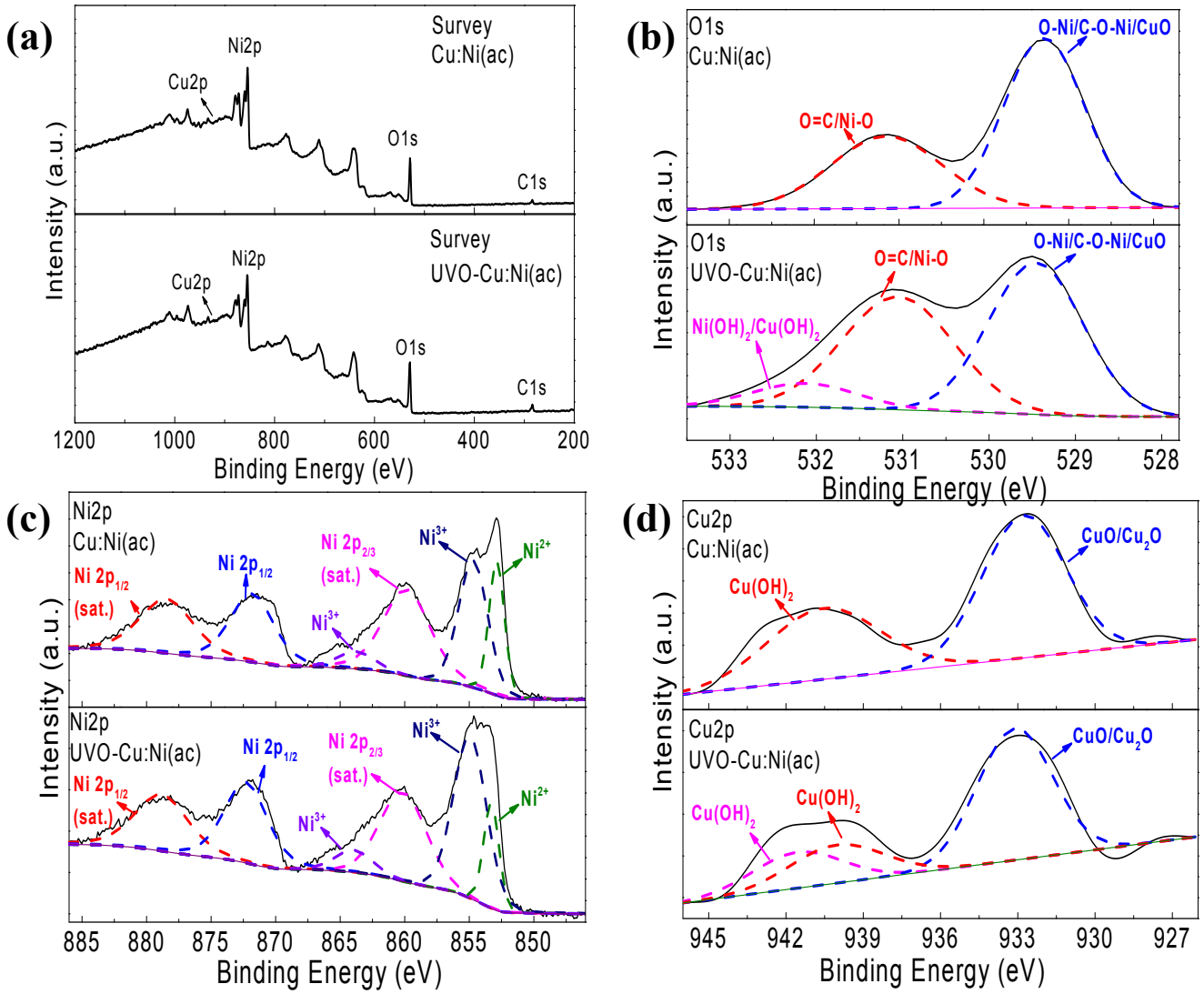

Figure S2. X-ray photoelectron spectroscopy (XPS) results of Cu:Ni(ac) and UVO-Cu:Ni(ac) thin films.; (a) survey scan. (b) O 1s narrow scan. (c) Ni 2p narrow scan. (d) Cu 2p narrow scan. [Reference peak is indicated inside.]

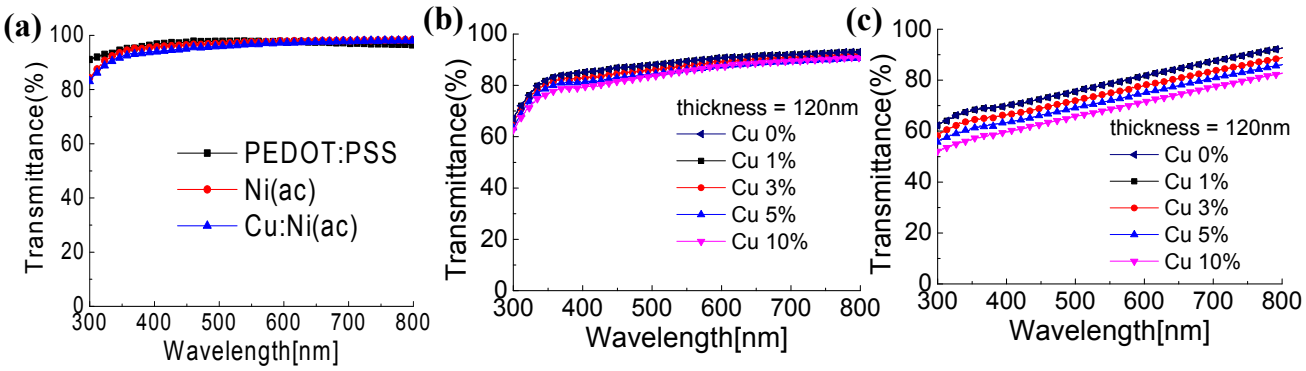

Figure S3. (a) Transmittances of thin films of PEDOT:PSS (31 nm), Ni(ac) (12 nm) and Cu:Ni(ac) (8 nm) respectively. (b) Optical transmittances of non-UVO irradiated 120 nm Cu:Ni(ac) films depending on copper doping ratio. (c) Optical transmittances of UVO-treated 120 nm Cu:Ni(ac) films.

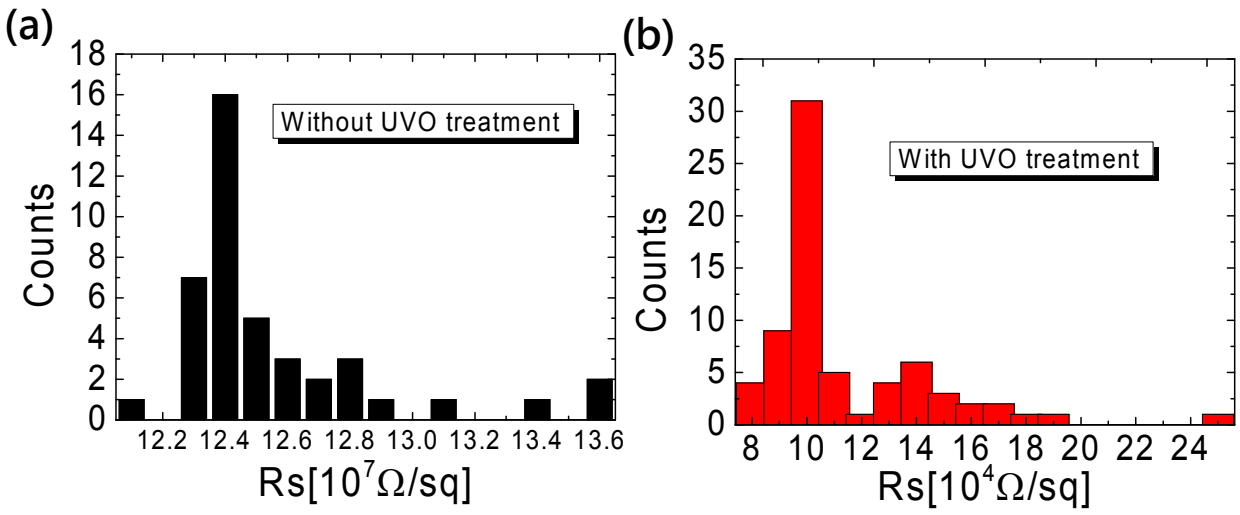

Figure S4. Repeatability of R_s(Sheet Resistance) values for Cu:Ni(ac) thin films.; (a) without UVO treatment. (b) With UVO treatment.

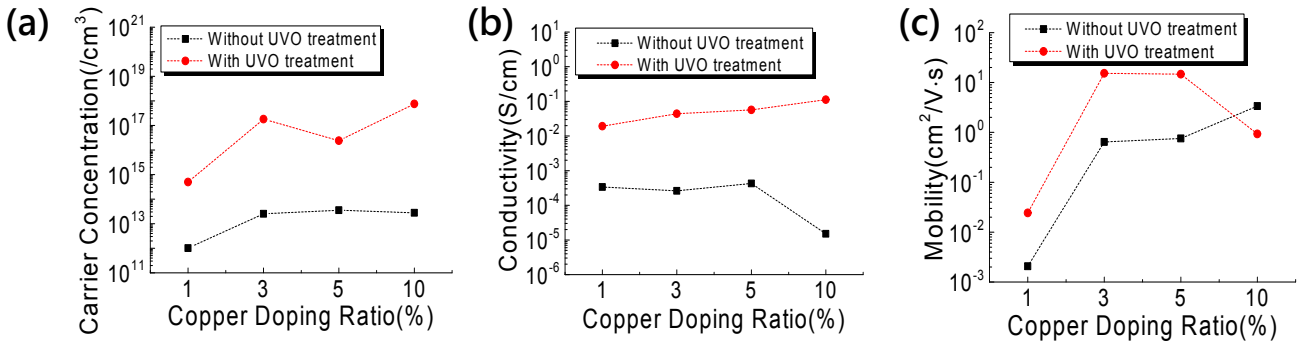

Figure S5. Copper doping ratio dependent hall effect results.; (a) carrier concentration [/cm^3]. (b) conductivity [S/cm]. (c) hall mobility [cm^2/V·s].

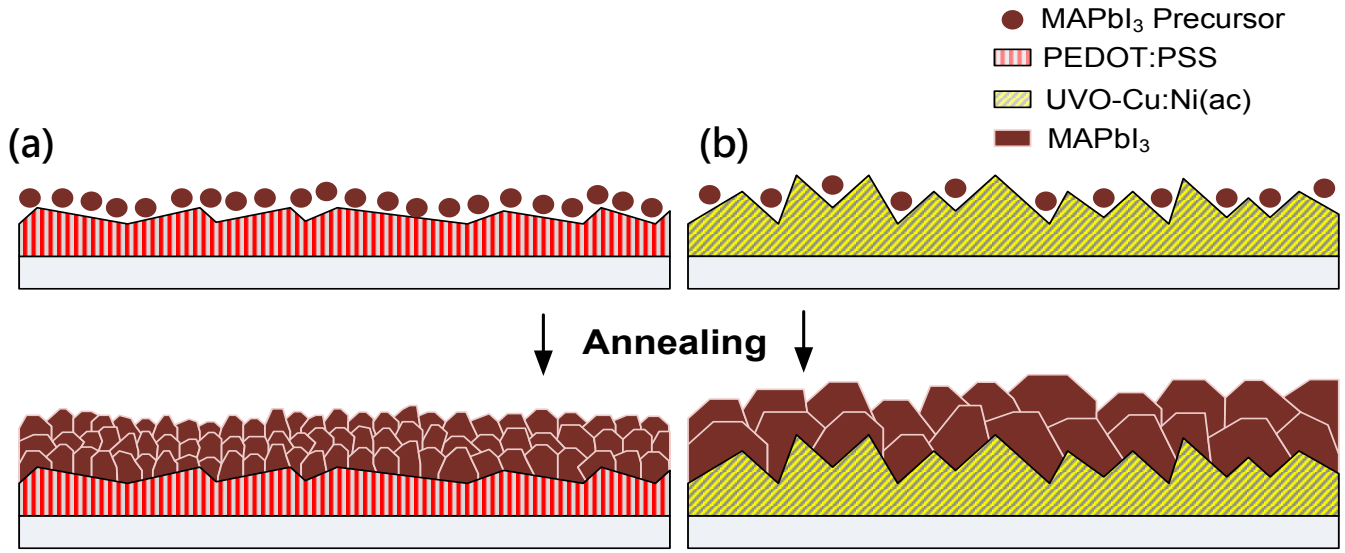

Figure S6. Schematic diagram of the $MAPbI_3$ crystallization process on the surface of thin films.; (a) on the PEDOT:PSS film (rms value = 1.482 nm). (b) on the UVO-Cu:Ni(ac) (rms value = 2.029 nm).

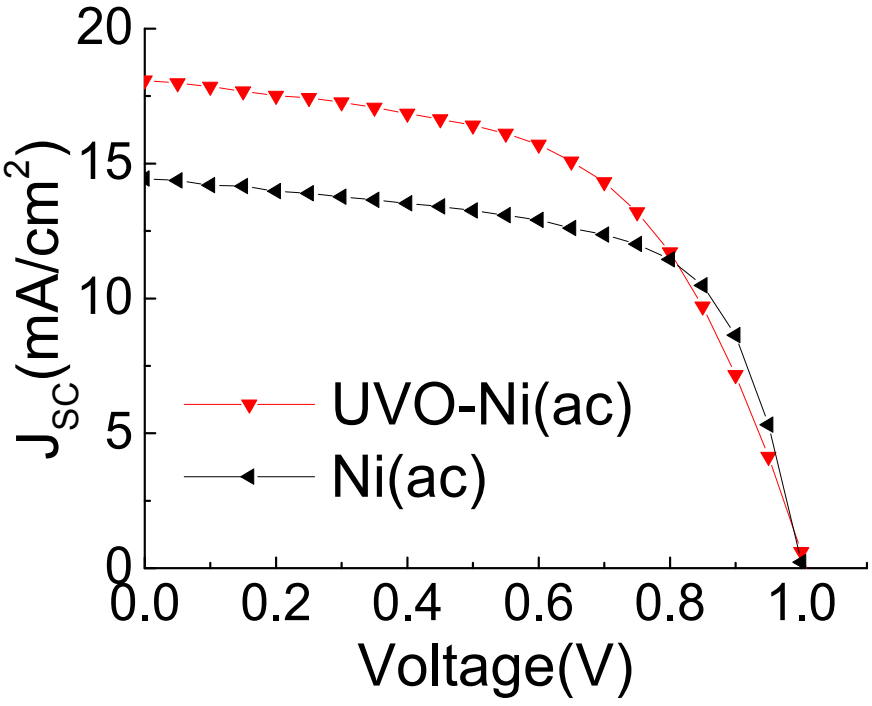

Figure S7. J-V characteristics of device performance measured at 100 mW/cm^2 based on Ni(ac) and UVO- Ni(ac) respectively.

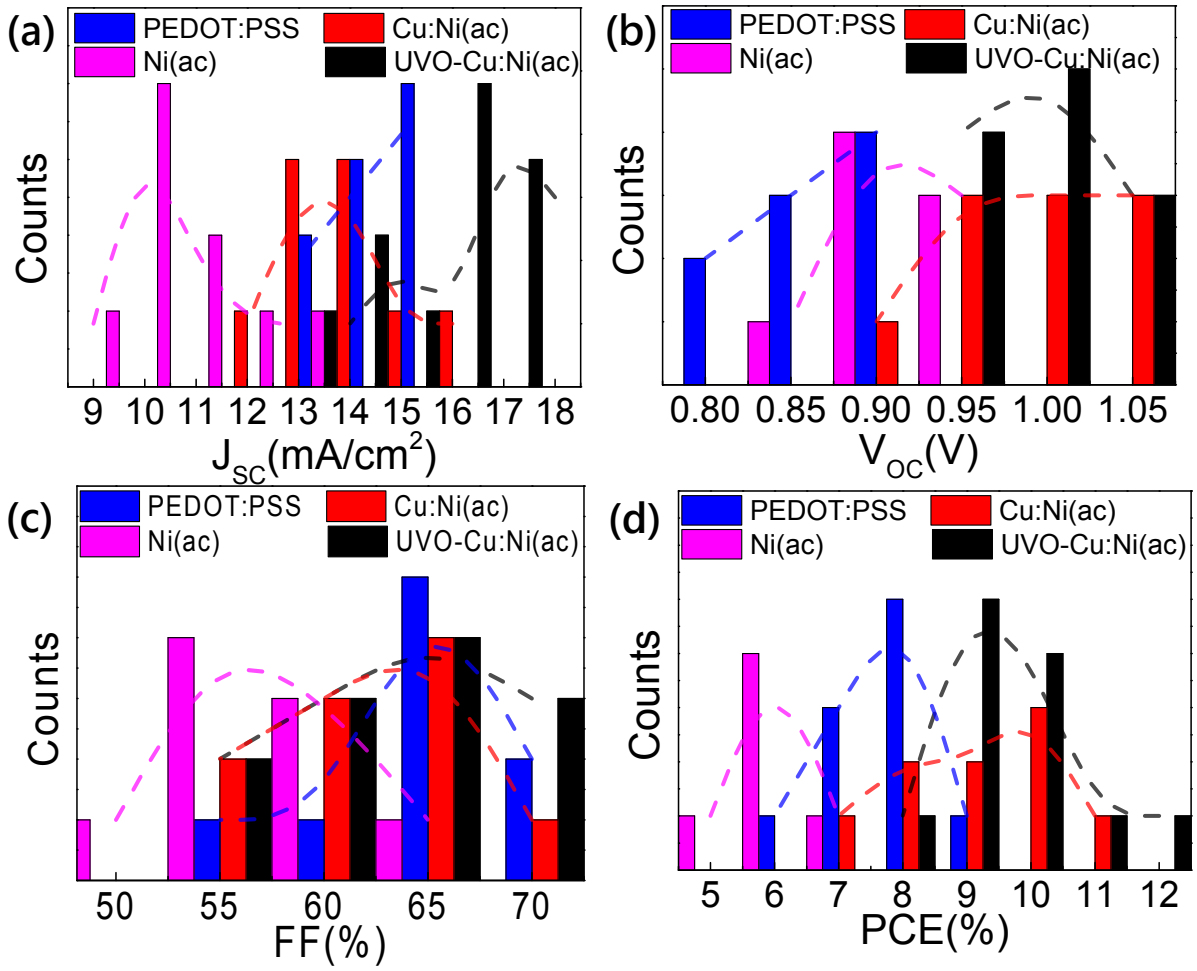

Figure S8. Repeatability of device performances based on different hole transport layers of PEDOT:PSS, Ni(ac) and Cu:Ni(ac).; (a) J_{SC}(mA/cm^2). (b) V_{OC}(V). (c) FF(%) and (d) PCE(%).