Supporting Information

A Liquid Junction Photoelectrochemical Solar Cells Based on p-Type $MeNH_3PbI_3$ Perovskite with 1.05 V Open-Circuit Photovoltage

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Materials. Methylamine (CH_3NH_2, 2M in methanol, Alfa Aesar), hydroiodic acid (HI, 57 wt% in water, Alfa Aesar), Lead iodide (PbI_2, 99.9985% metals basis, Alfa Aesar), Lithium iodide (LiI, 99.99%, Sigma-Aldrich), Iodine (I_2, 99.999% metals basis, Alfa Aesar), Tetrabutylammonium iodide (TBAI, ≥ 99.0%, Sigma-Aldrich), Ferrocene (Fc, 99.5 %, Alfa Aesar), ferrocenium hexafluorophosphate ($FcPF_6$, 97%, Sigma-Aldrich), Decamethylferrocene (DMFc, 99 %, Alfa Aesar), p-Benzoquinone (BQ, ≥98 %, Alfa Aesar), N,N-Dimethylformamide (DMF, ≥99.9 %, Sigma-Aldrich), Acetonitrile (MeCN, anhydrous, ≥99.9 %, Sigma-Aldrich), Chloroform ($CHCl_3$, anhydrous, ≥99.9 %, Sigma-Aldrich), Methylene chloride (CH_2Cl_2, anhydrous, ≥99.9 %, Sigma-Aldrich), Tetrahydrofuran (THF, anhydrous, ≥99.9 %, Sigma-Aldrich), Ethyl acetate (EA, anhydrous, ≥99.8 %, Sigma-Aldrich), Toluene (anhydrous, ≥99.9 %, Sigma-Aldrich), Dimethyl sulfoxide (DMSO, anhydrous, ≥99.9 %, Sigma-Aldrich). Tetrabutylammonium hexafluorophosphate ($TBAPF_6$, ≥99.9 %, Sigma-Aldrich). FTO-coated glass was obtained from Pilkington (Toledo, OH) as a substrate of the electrodes. The 15 × 15 mm squares were

cleaned by successive sonication in ethanol and 2-propanol and rinsed with deionized water. Duocel Reticulated Vitreous Carbon was used as a counter electrode (RVC, Ergaerospace)

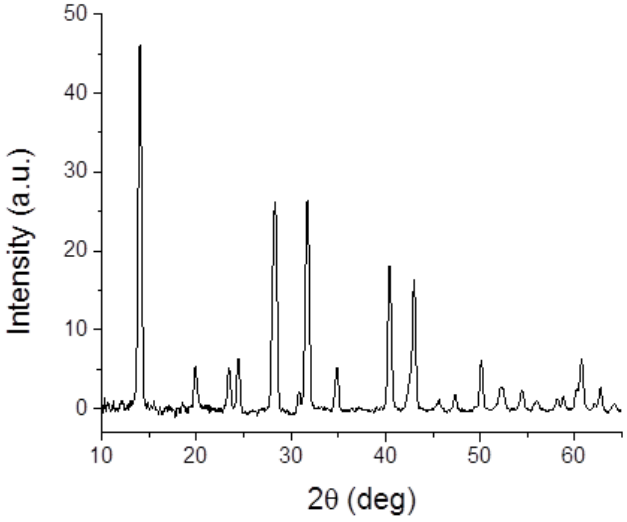

Figure S-1. XRD of p-$MeNH_3PbI_3$

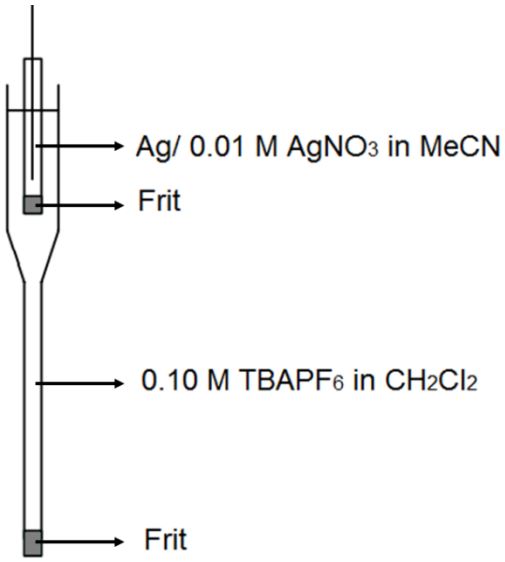

Figure S-2. A silver wire immersed in 0.01 M silver nitrate in MeCN with a 0.10 M $TBAPF_6$ in CH_2Cl_2 salt bridge

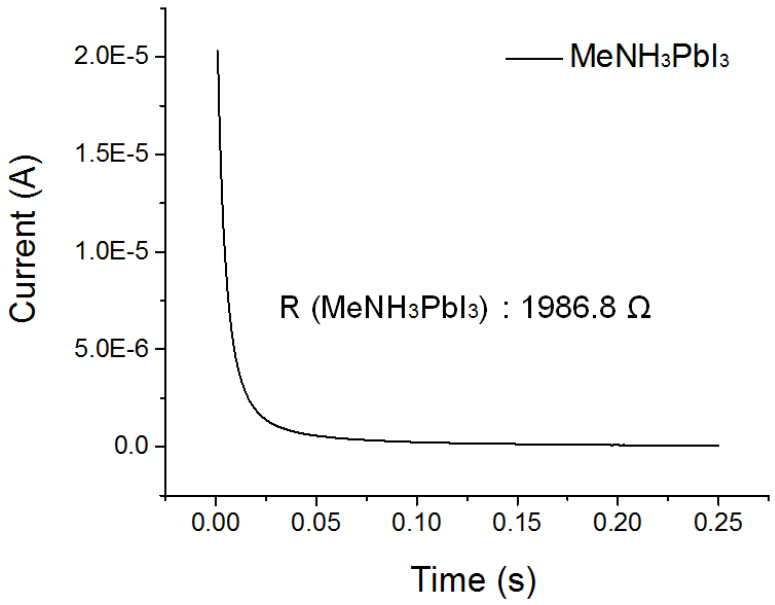

Figure S-3. Uncompensated resistance of p- $MeNH_3PbI_3$ in CH_2Cl_2 containing 0.1M $TBAPF_6$.

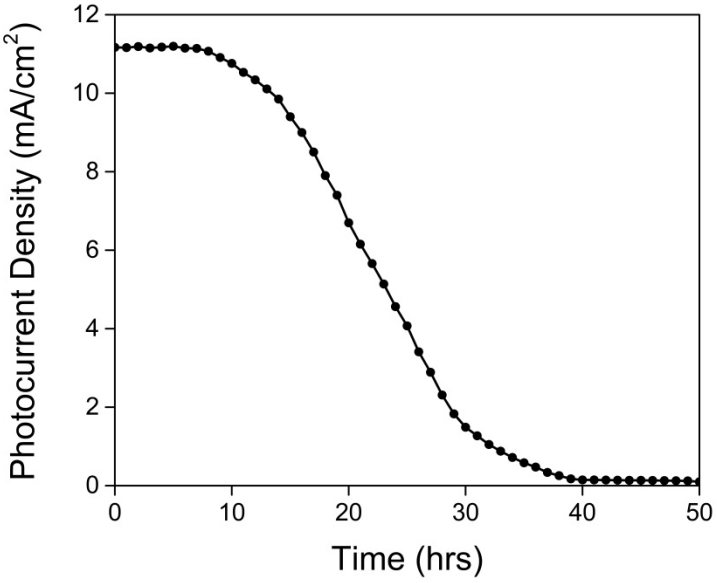

Figure S-4**.** Time dependence of the photocurrent of a p-$MeNH_3PbI_3$/BQ (2 mM), $BQ^{\bullet-}$ (2 mM)/carbon PEC cell at 0.5 V. The p-$MeNH_3PbI_3$ photoelectrode was irradiated by a 150 mW/cm^2 Xe lamp. The optical path through the solution was about 0.3 mm.