Supporting Information

Perovskite- Hematite Tandem Cells for Efficient Overall Solar Driven Water Splitting

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1. ISTC calculation:

The electric power generated by hematite photoanodes is further reduced by the conversion efficiency of the chemical reaction rate by the following equation;

$$\eta_{cl} = \frac{1.23V_{RHE} \times \eta_F}{U_{Dark}} \qquad (S1)$$

Where η_F is Faradaic efficiency, which is nearly 100% for hematite photoanode and U_{Dark} is the potential applied in dark to reach the same current density as observed in light. The chemical reaction rate is 64 % and 60 % at the observed current density where U_{dark} = 1.9 and 2.07 V vs. RHE. Thus, the light-induced contribution to the chemical power produced by the photoanode is 64%×0.82(mWcm^{-2}) = 0.52 mWcm^{-2} for pristine hematite and 60%×3(mWcm^{-2}) = 1.80 mWcm^{-2} for Mn doped hematite, which correspond to an ISTC efficiency of 0.52% and 1.80 % for pristine and Mn doped hematite respectively.

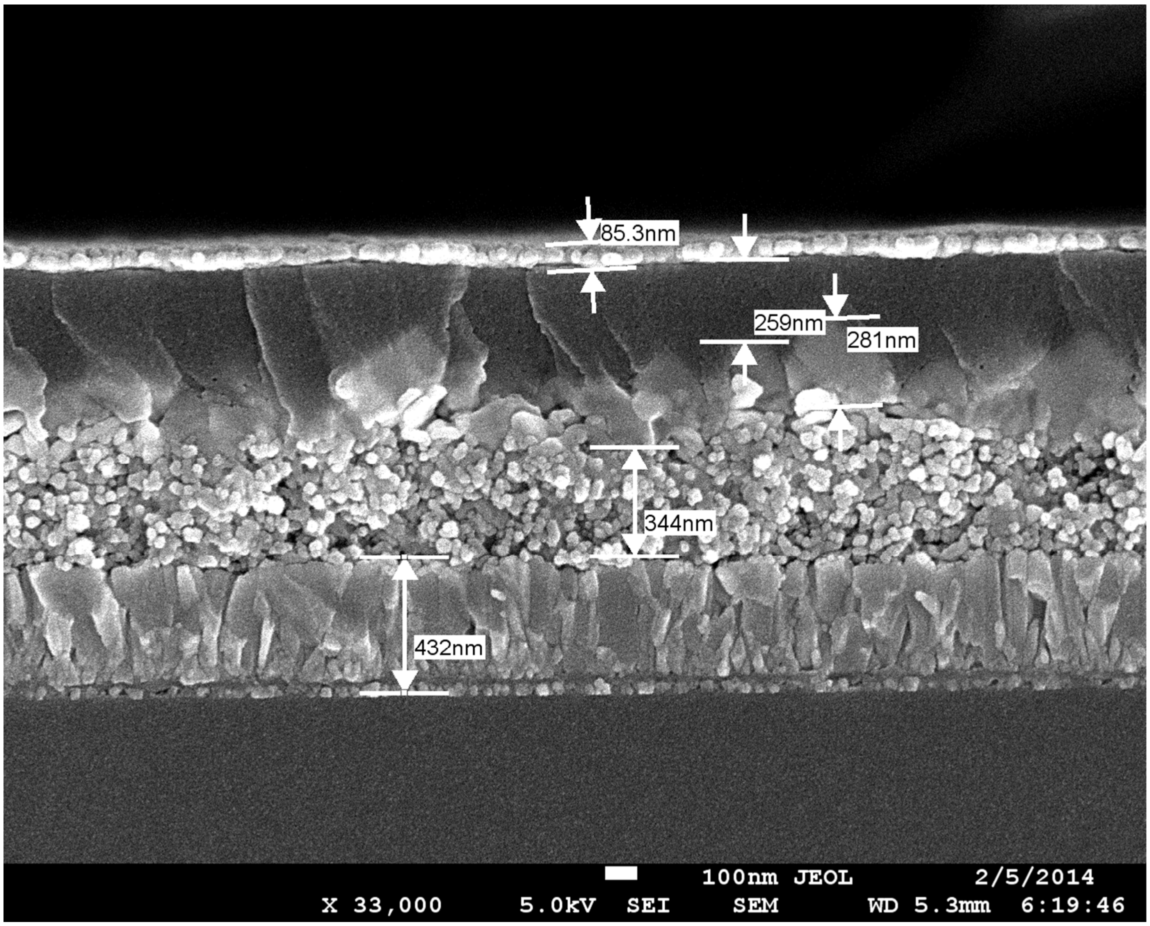

Figure S1. Cross-sectional image of perovskite solar cell (SC) employed in this study.

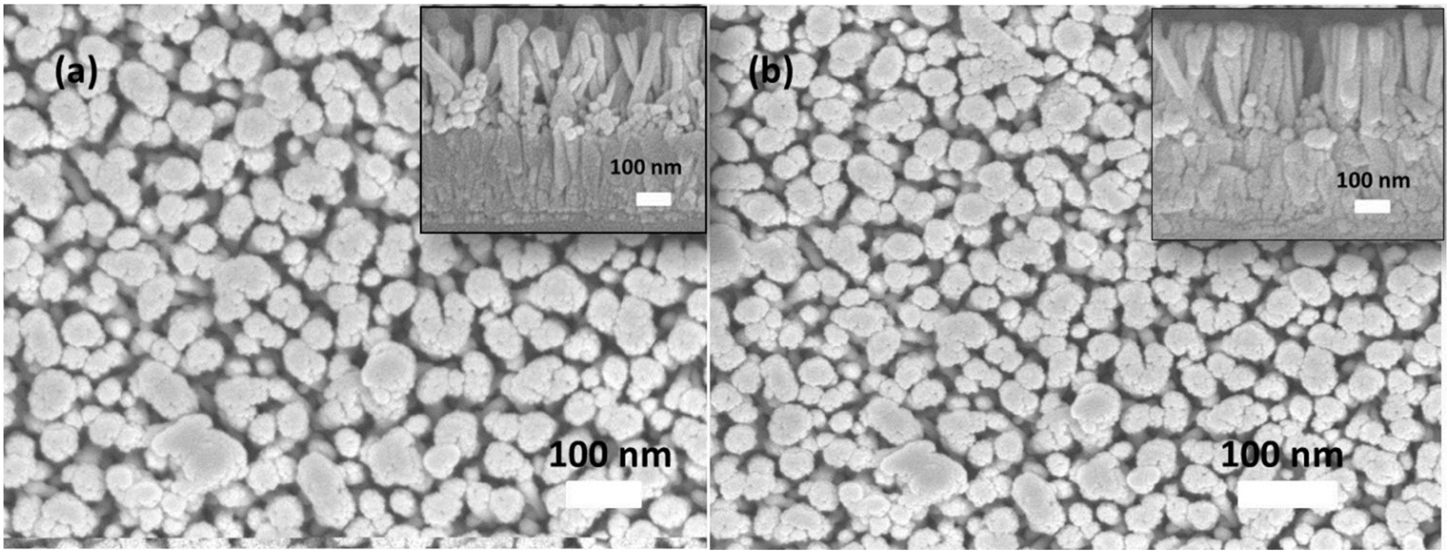

Figure S2. (a) FESEM surface morphology of pristine hematite photoanode and (b) FESEM surface morphology of Mn doped hematite photoanode.

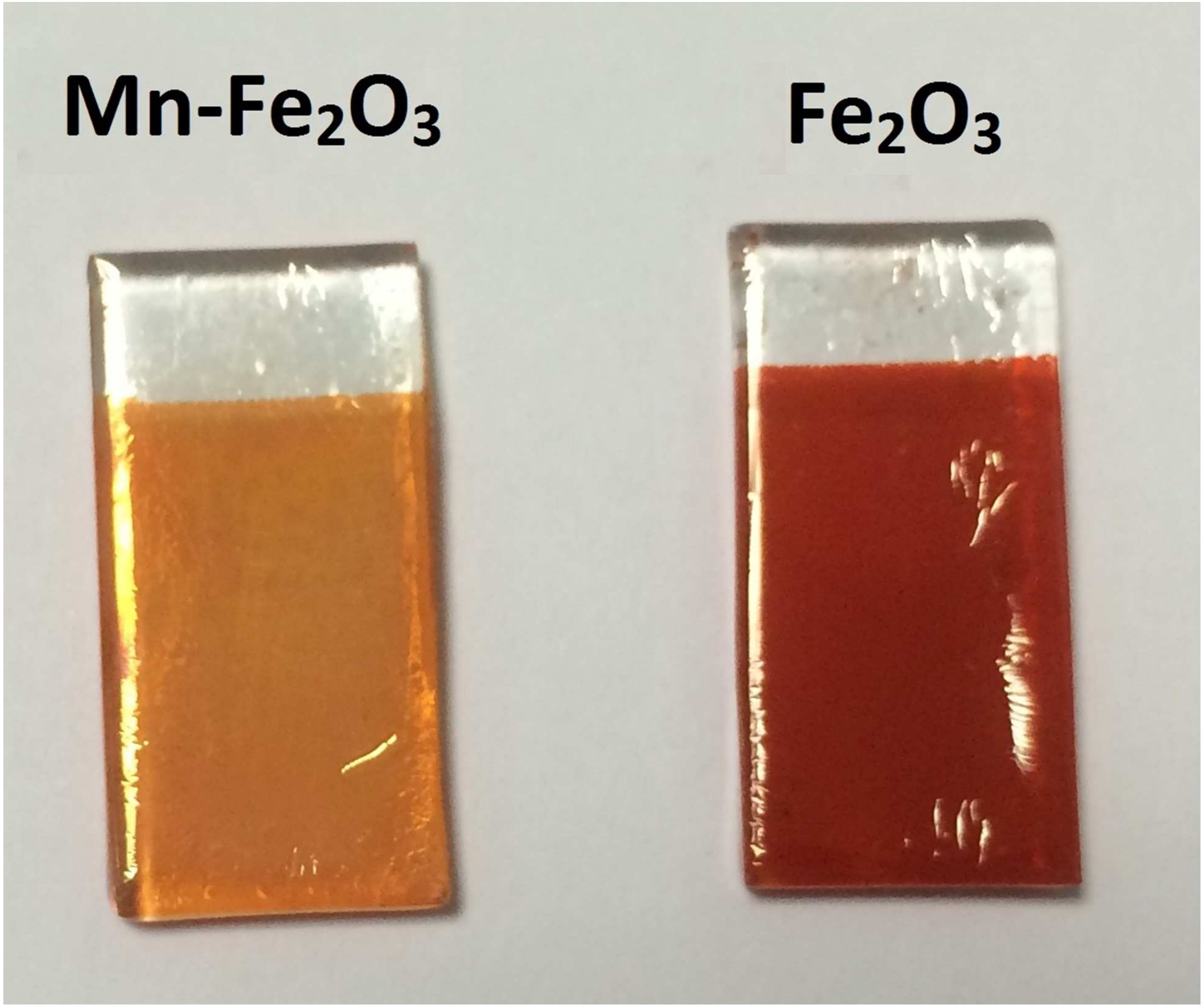

Figure S3. Image of Mn doped sample and pristine sample.

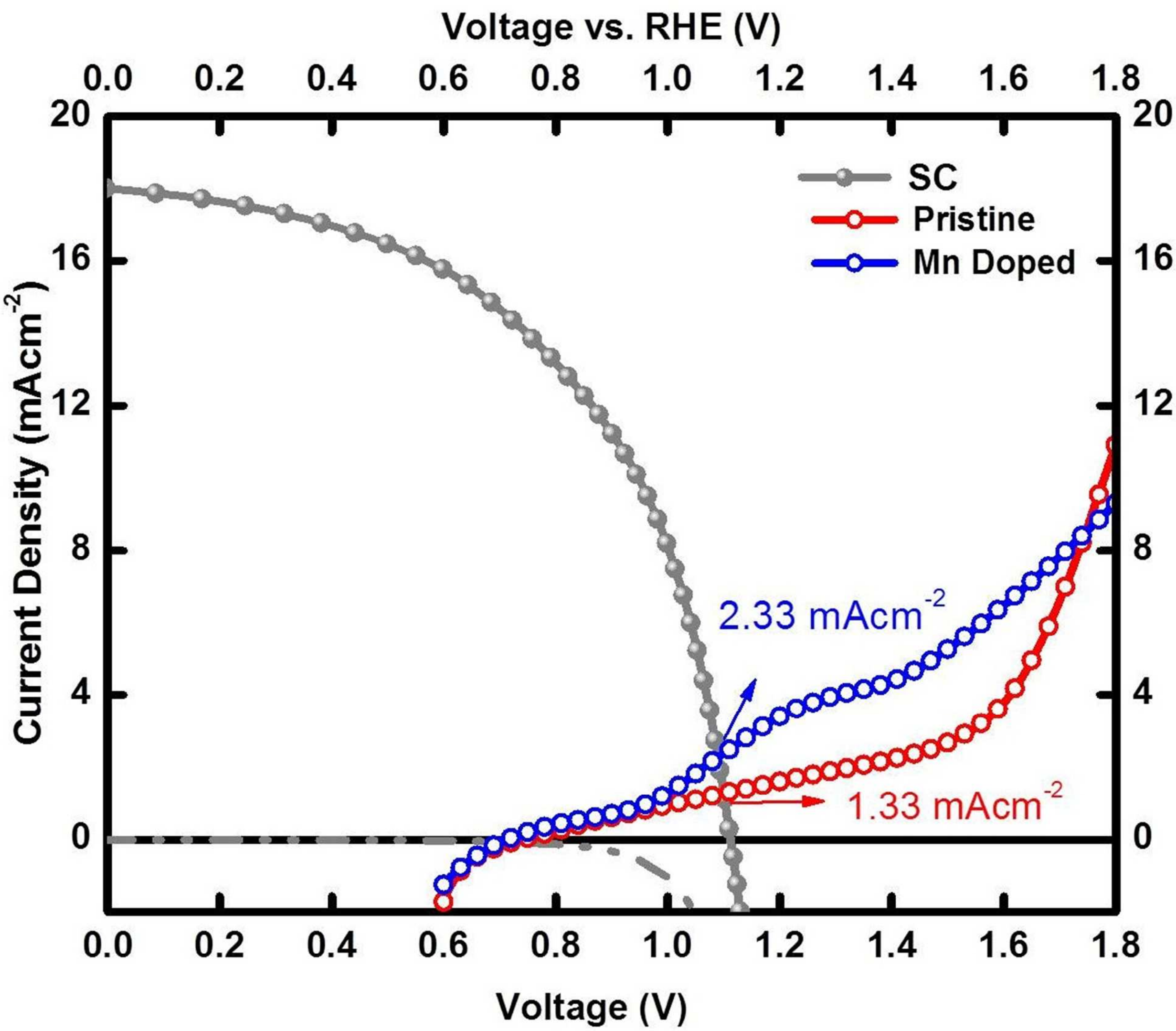

Figure S4. Current-Voltage curve of a Perovskite solar cell and hematite photoanode measured separately under standard AM 1.5G irradiation.

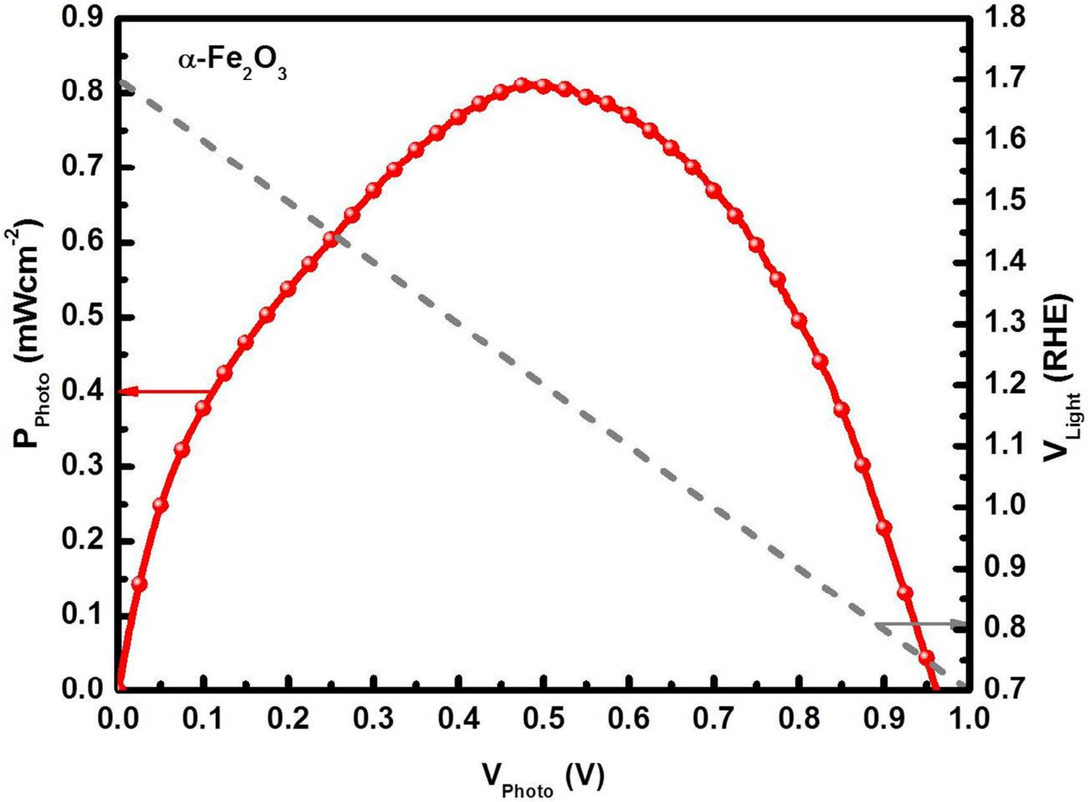

Figure S5. The intrinsic power characteristics of pristine hematite photoanode.

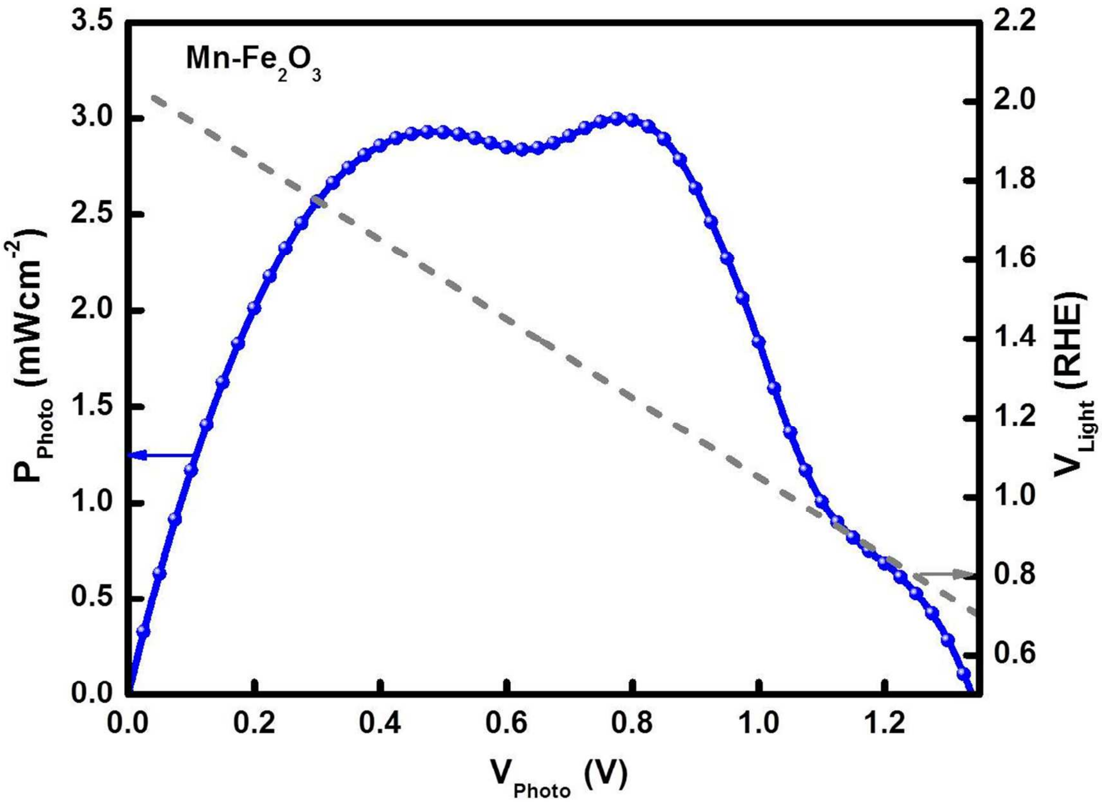

Figure S6. The intrinsic power characteristics of Mn doped hematite photoanode.

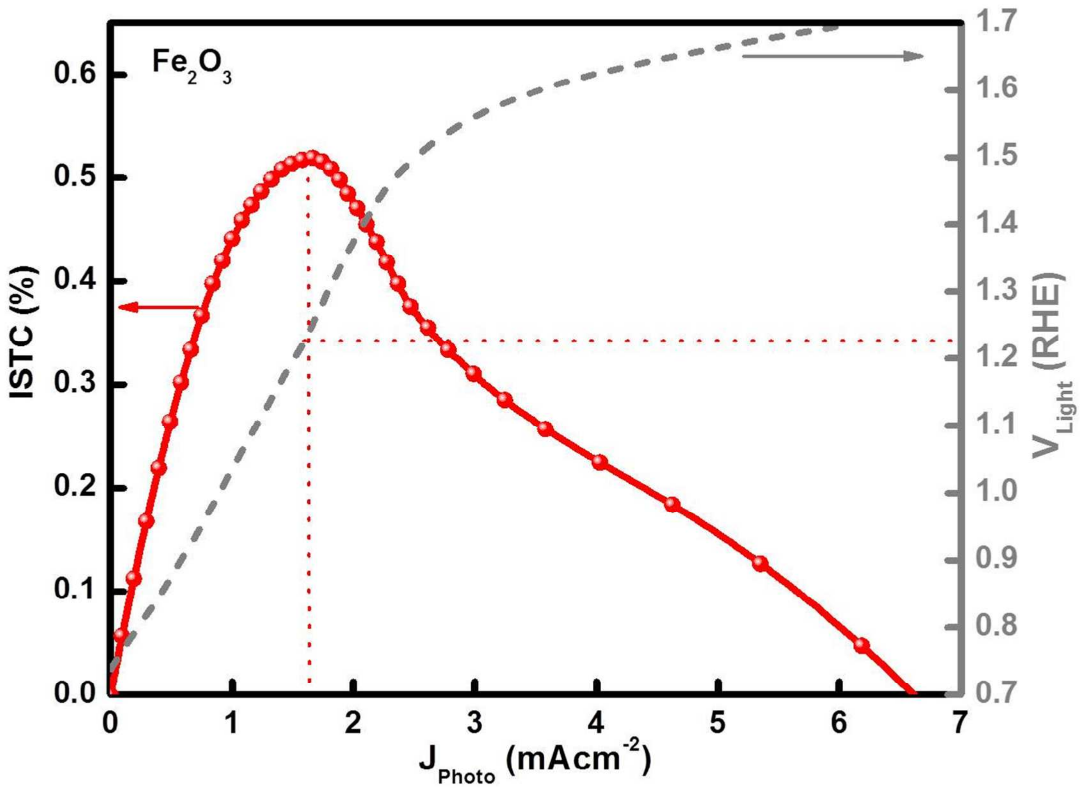

Figure S7. Intrinsic solar to chemical conversion efficiency (ISTC) of pristine hematite photoanode.