Electronic Supplementary Material (ESI) for Energy & Environmental Science

Supporting information

Facile Synthesis of Carbon-coated Hematite Nanostructures for Solar Water Splitting

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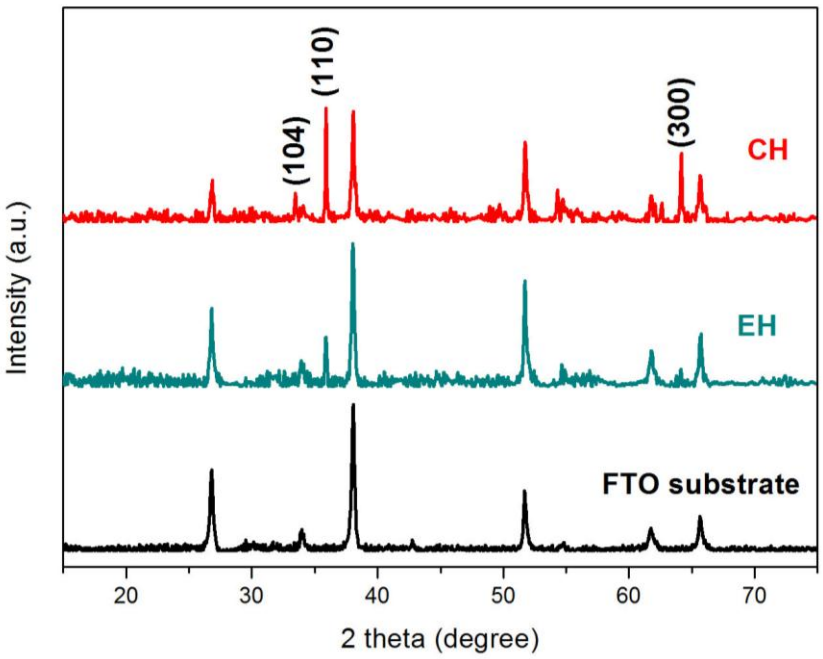

Figure S1: XRD spectra collected for CH and EH sintered at 550 °C for 2h and then annealed at 750 °C for 10 min.

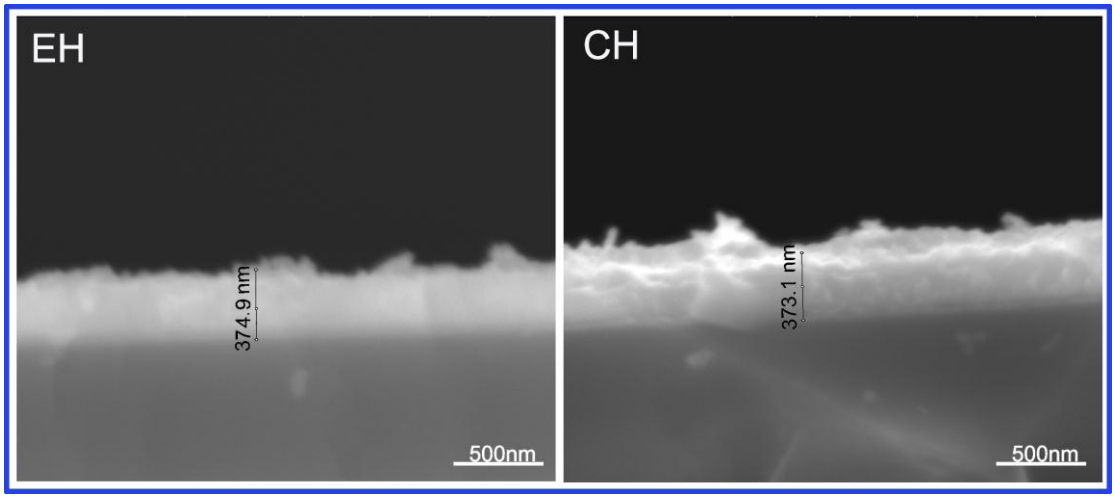

Figure S2: SEM images of the cross sections of EH and CH samples after annealing. The thickness labeled in the image with black color stands for a total thickness of FTO conductive film and hematite film (conductive film + hematite film). The thickness of FTO conductive film is 350 nm (measured with blank FTO substrate after the same annealing treatment). Thus the thickness is about 25 ± 5 nm for both CH and EH hematite films. The thickness of CH and EH is very similar.

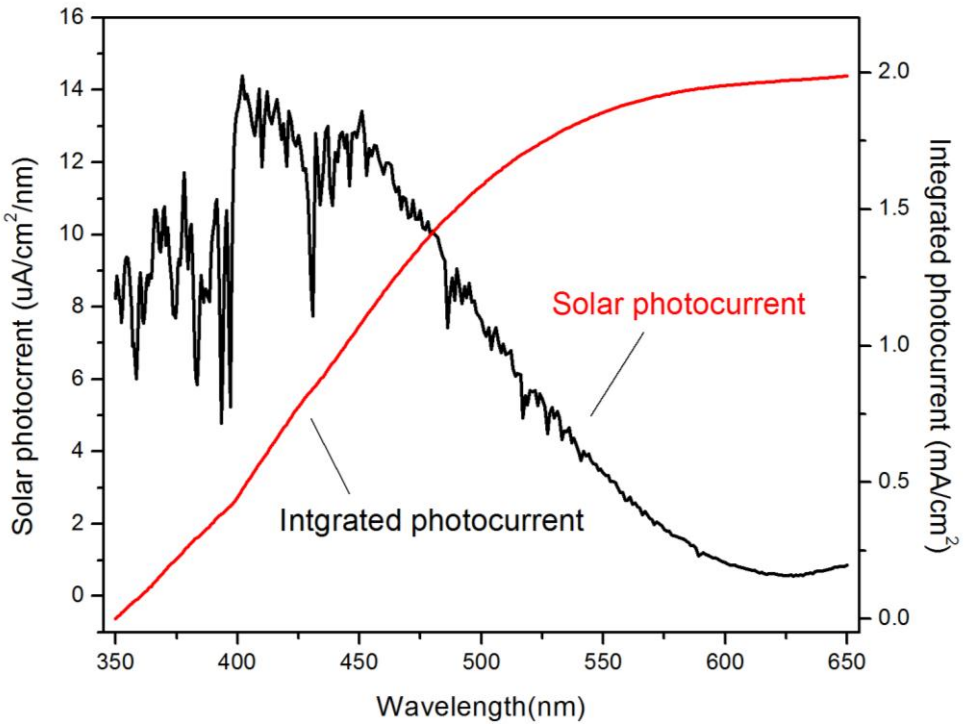

Figure S3: The integrated photocurrent based on the IPCE data (350 nm to 650nm). The photocurrent density was calculated by integrating the IPCE spectra with a standard AM 1.5G solar spectrum (ASTMG-173-03), using the following equation:

$$I = \int_{350}^{650} \frac{1}{1240} \lambda IPCE(\lambda) E(\lambda) d\lambda$$

where E(λ) is the solar spectral irradiance at a specific wavelength (λ) and IPCE(λ) is the obtained IPCE profile as a function of wavelengths (λ) at 1.23 V vs. RHE. The calculated photocurrents are 2.0 mA cm^{-2} and 0.4 mA cm^{-2} for CH and EH, respectively.

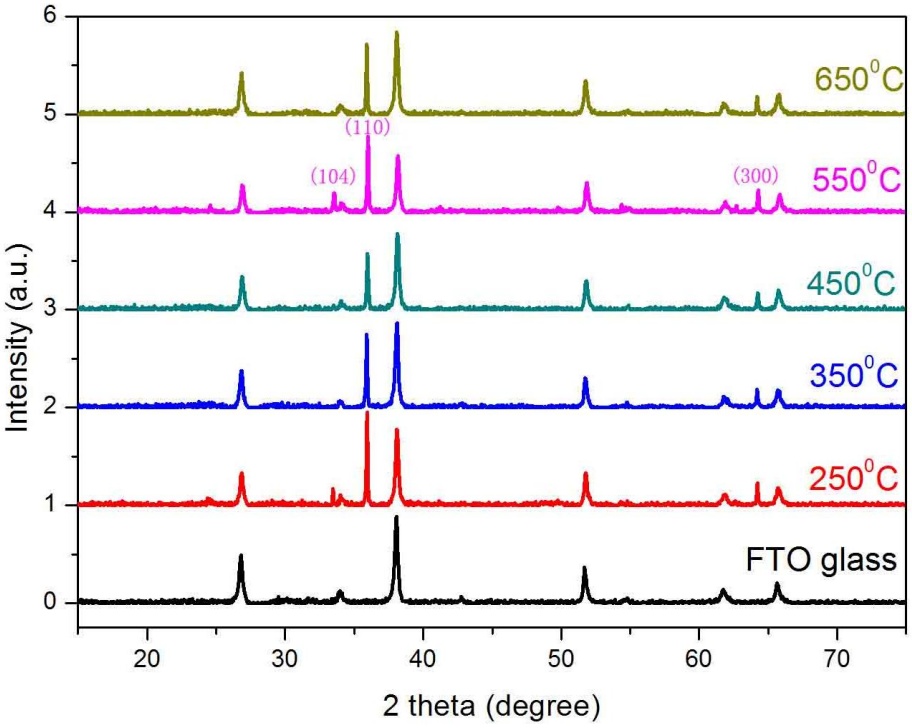

Figure S4: XRD spectra collected for CH hematite nanostructures sintered from 250 °C to 650 °C and then annealed at 750 °C for 10 min.

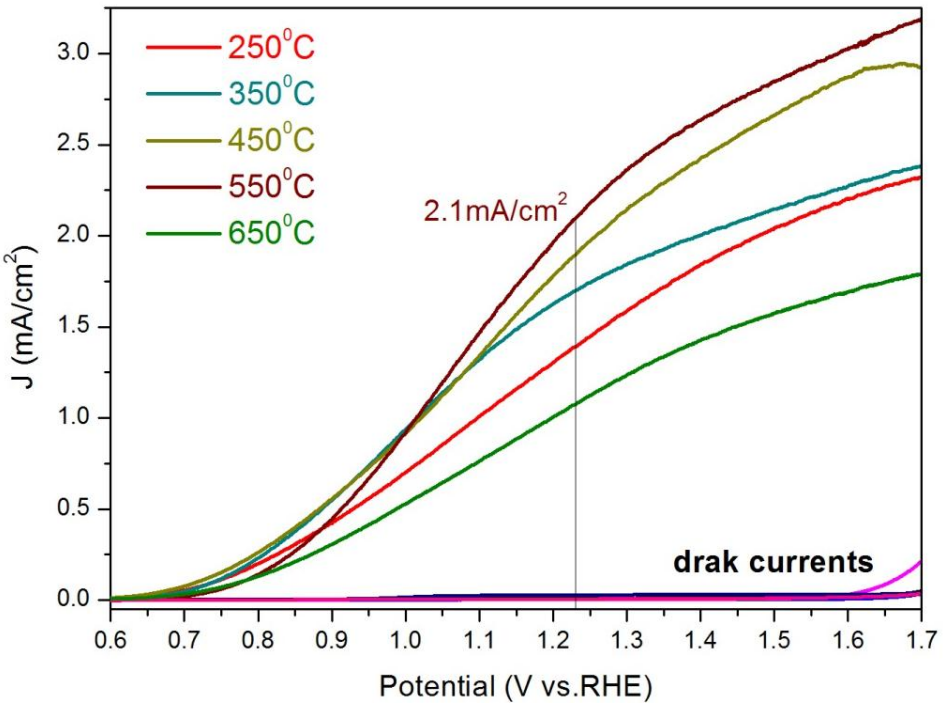

Figure S5: *J-V* curves of CH sintered from 250 °C to 650 °C and then annealed at 750 °C for 10 min.

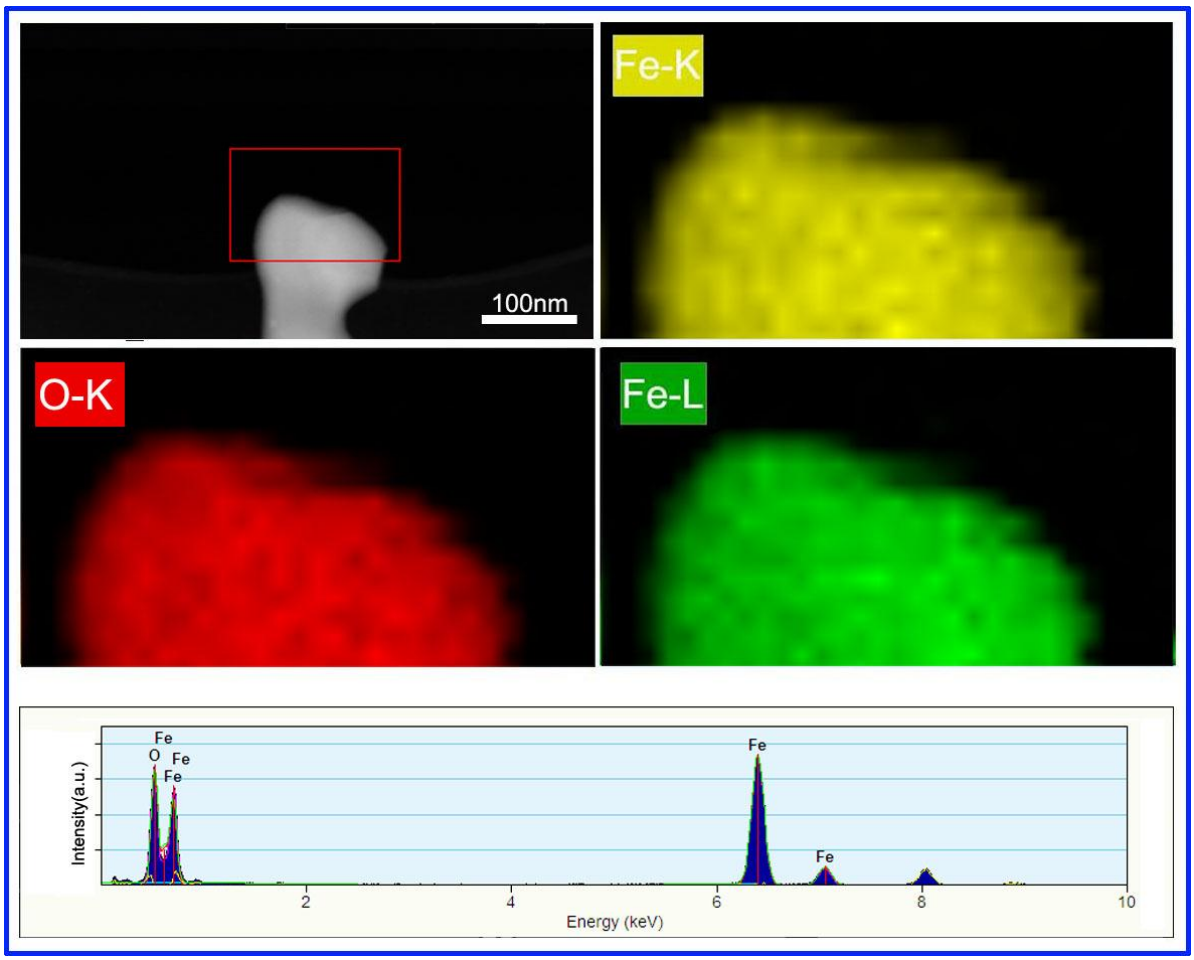

Figure S6: Elemental mapping of hematite nanostructures scratched from EH: O (red), and Fe (yellow and green) distribution in the selected area. The bottom panel shows the EDX spectrum of the selected area.

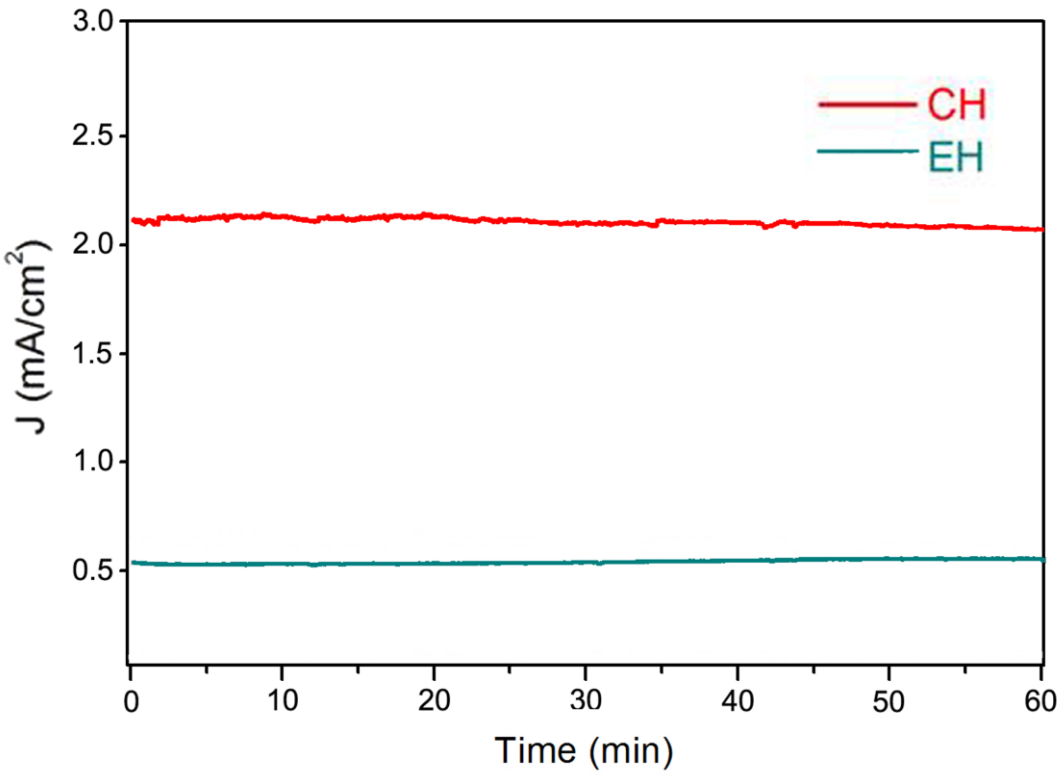

Figure S7: Photochemical stability curves of CH and EH collected at 1.23V vs. RHE.

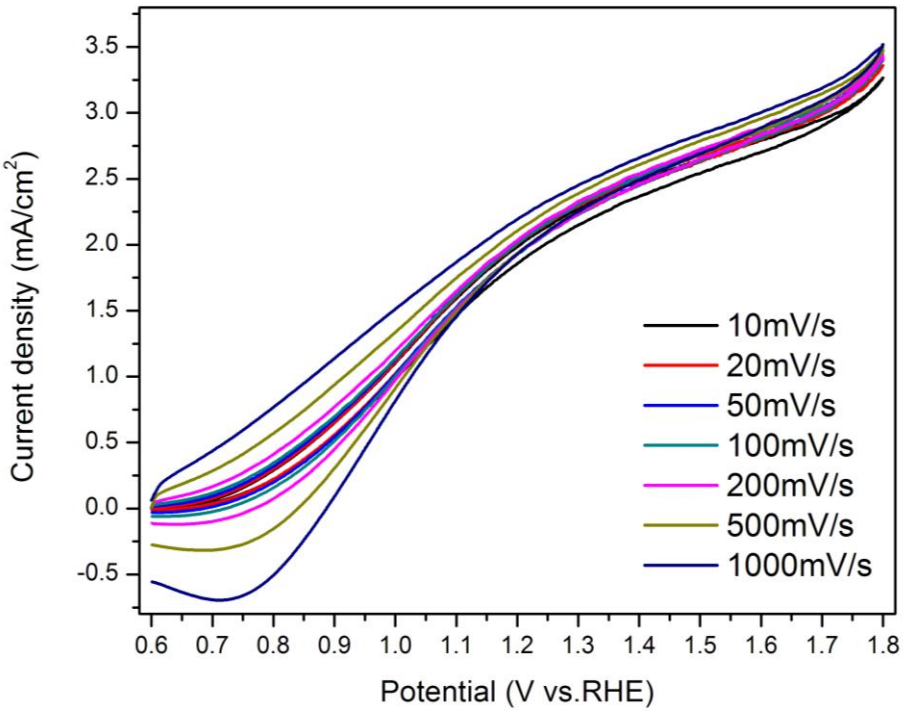

Figure S8: CV curves of CH collected at various scan rates with the potentials between 0.6 to 1.8 V vs. RHE.