

Supporting information

Substrate dependent solar water oxidation performance of ultrathin α - Fe_2O_3 electrodes

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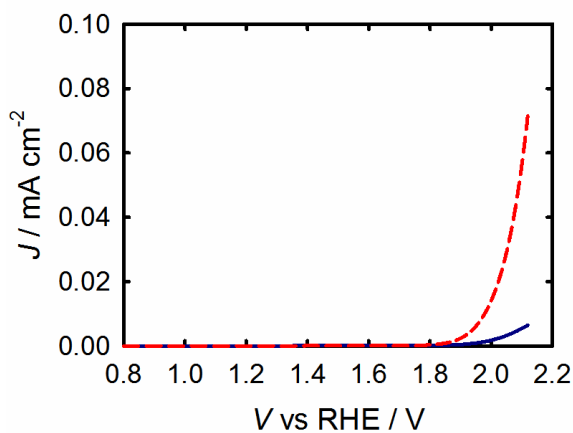


Figure 1S. J - V curves of ~ 18 nm hematite electrodes with (solid dark blue) and without (dashed red) Ga_2O_3 underlayer, under water oxidation condition in dark.

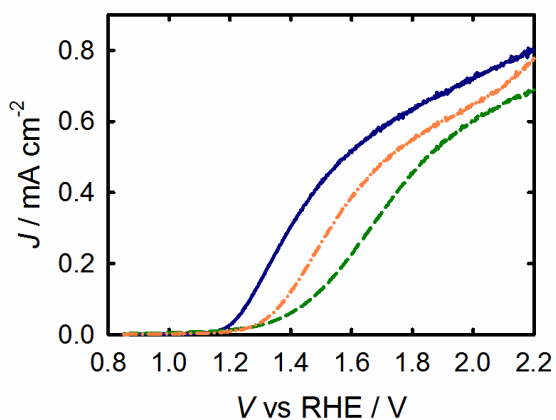


Figure 2S. J - V curves of ~ 18 nm hematite electrodes with 1 (dash-dotted orange), 2 (solid dark blue) and 4 nm (dashed green) Ga_2O_3 underlayer, under water oxidation condition and 1 sun illumination.

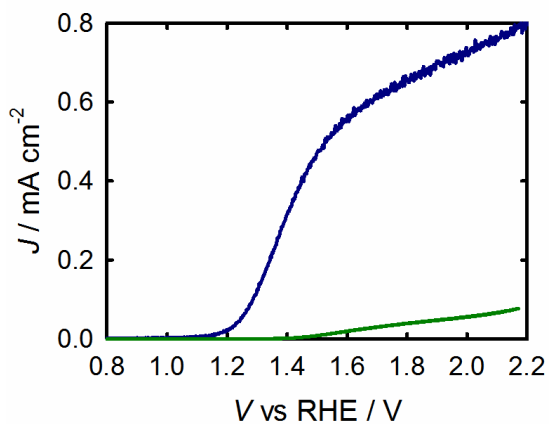


Figure 3S. J - V curves of ~ 18 nm hematite electrodes with a 2 nm (18 ALD cycles) Ga_2O_3 underlayer (dark blue) and the same thickness of hematite without underlayer but doped with the same ALD cycles of Ga_2O_3 (green). J - V s obtained under water oxidation condition in pH 7 and 1 sun illumination.

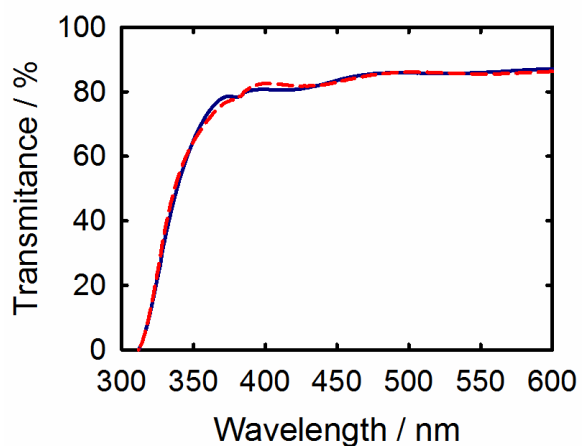


Figure 4S. Transmittance of FTO (dashed red) and FTO coated with 2 nm Ga_2O_3 (solid dark blue).

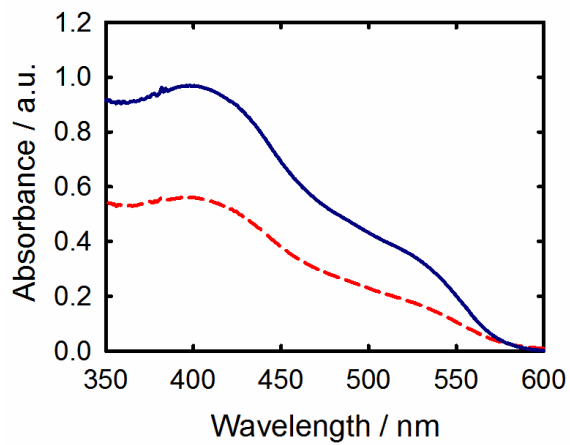


Figure 5S. Absorbance spectra of ~ 18 nm hematite with (solid dark blue) and without (dashed red) a Ga_2O_3 underlayer.

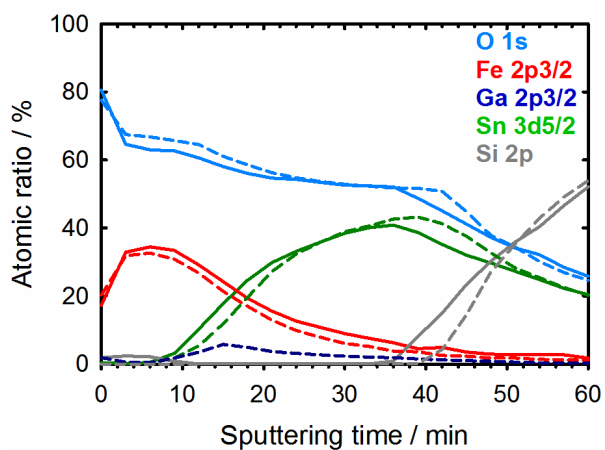


Figure 6S. XPS depth of hematite films with (dashed lines) and without (solid lines) Ga_2O_3 underlayer deposited on SnO_2 coated Si wafer.

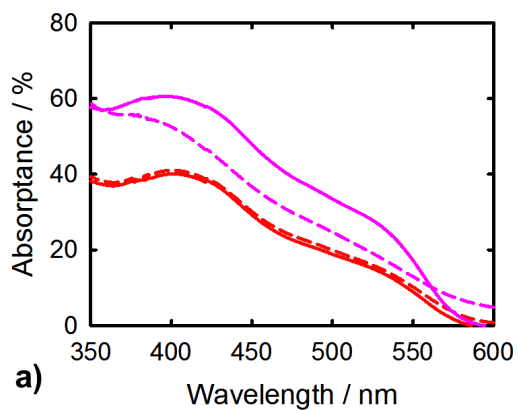


Figure 7S. a) Absorbance spectra of 18 nm hematite films with (pink) and without (red) Nb_2O_5 underlayer before (dashed lines) and after (solid lines) annealing in 500 °C.

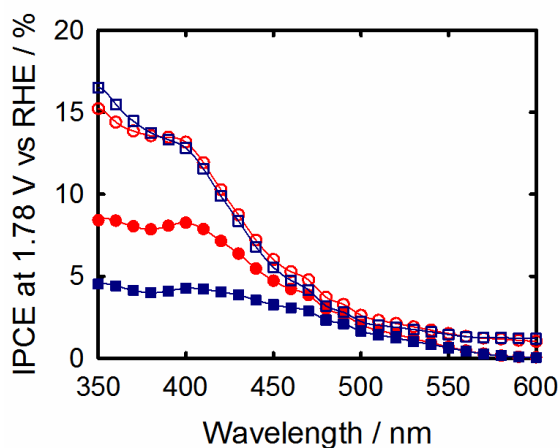


Figure 8S. IPCE of 60 nm hematite electrodes with (dark blue squares) and without (red circles) Ga₂O₃ underlayer under the condition of back (solid shapes) and front side (open shapes) illumination at 1.78 V vs RHE.

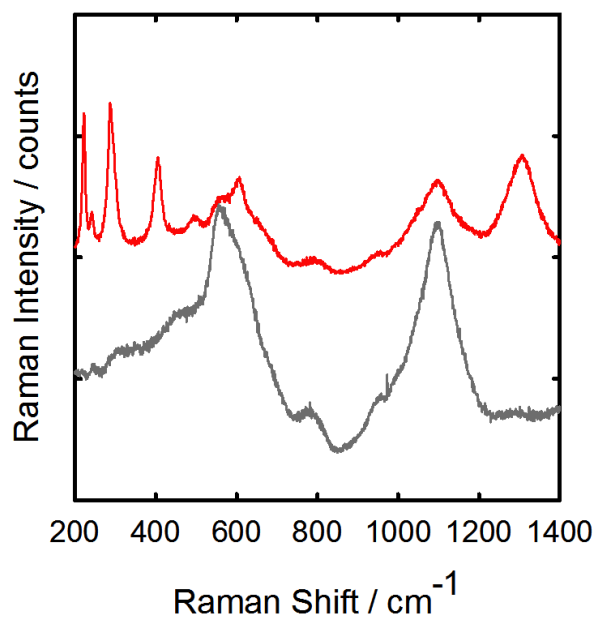


Figure 9S. Raman spectrum of a 60 nm hematite (red) film deposited on FTO overlaid with that of the FTO substrate (grey).

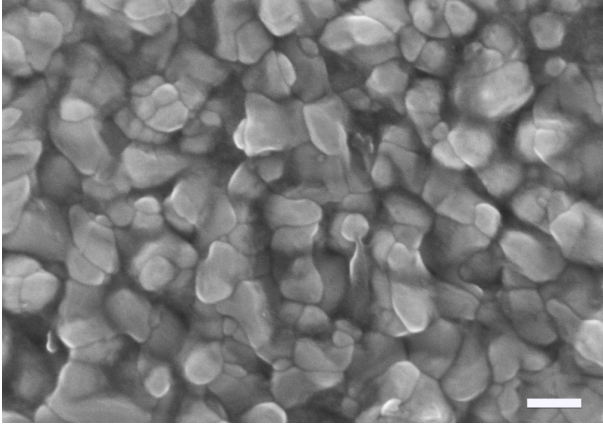


Figure 10S. SEM images of 18 nm hematite on FTO with 2 nm Nb₂O₅ underlayer. Scale bar is 100 nm.

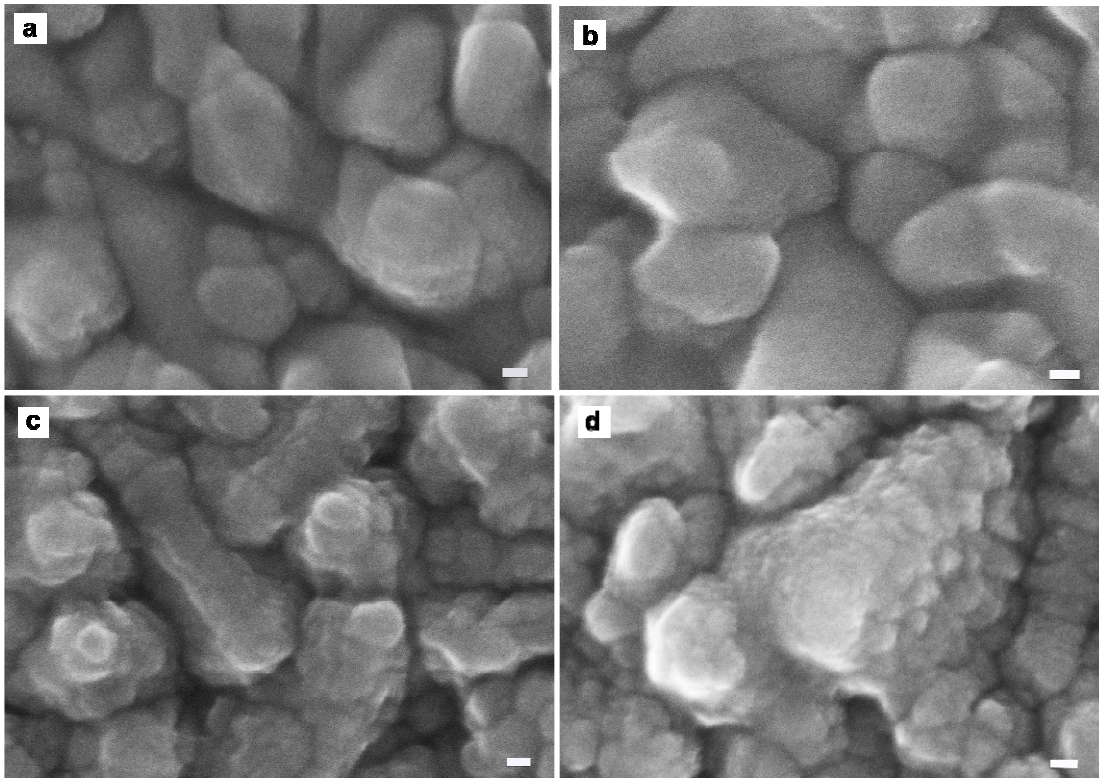
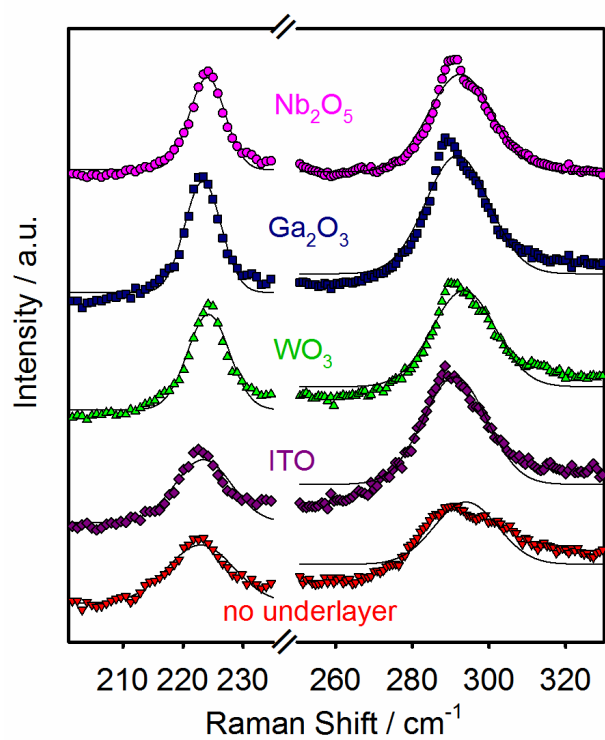


Figure 11S. SEM images of 18 nm hematite on FTO with (a and b) and without (c and d) a Ga₂O₃ underlayer. The scale bar is 20 nm in each case.



Substrate	Nb ₂ O ₅	Ga ₂ O ₃	WO ₃	ITO	FTO
FWHM / cm ⁻¹ (Peak at 223 cm ⁻¹)	4.96	5.03	5.83	7.86	9.30
FWHM / cm ⁻¹ (Peak at 288 cm ⁻¹)	12.20	12.40	14.30	15.15	27.97

Figure 12S. Experimental and Gaussian fit of two Raman phoneme modes for 18 nm hematite films deposited on different underlayers. A table of fit FWHM values is also shown.