Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Hematite Homojunctions without Foreign Element Doping for Efficient and Stable Overall Water Splitting

Qing Yu,[a][b] Xianguang Meng,[b] Li Shi,[a][b] Guigao Liu,[a][b] Peng Li,[b] and Jinhua Ye*[a][b][c][d]

[a] Graduate School of Chemical Science and Engineering, Hokkaido University, Sapporo, 060-0814, Japan

[b] International Center for Materials Nanoarchitectonics (WPI-MANA), and Environmental Remediation Materials Unit, National Institute for Materials Science (NIMS), 1-1 Namiki, Tsukuba, Ibaraki, 305-0044, Japan

[c] TU-NIMS Joint Research Center, School of Material Science and Engineering, Tianjin University, 92 Weijin Road, Tianjin, P.R. China

[d] Collaborative Innovation Center of Chemical Science and Engineering (Tianjin), Tianjin 300072, People's Republic of China

** Corresponding author, TEL: +81-29-859-2646, E-mail: Jinhua.YE@nims.go.jp*

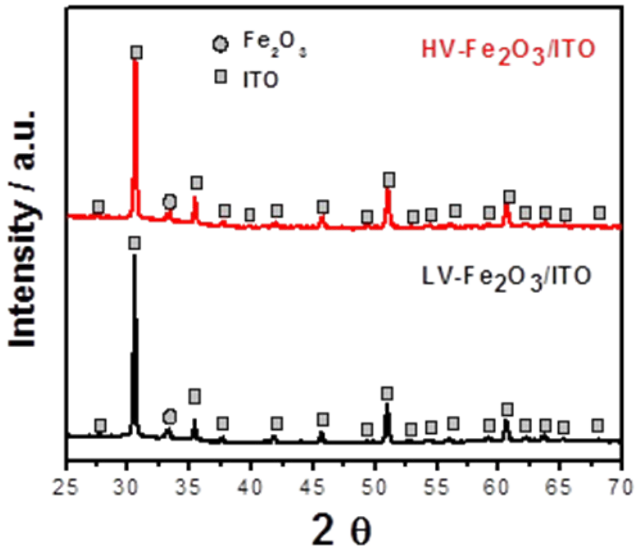

Figure S1. XRD patterns for bare HV-Fe_2O_3 and bare LV-Fe_2O_3 respectively.

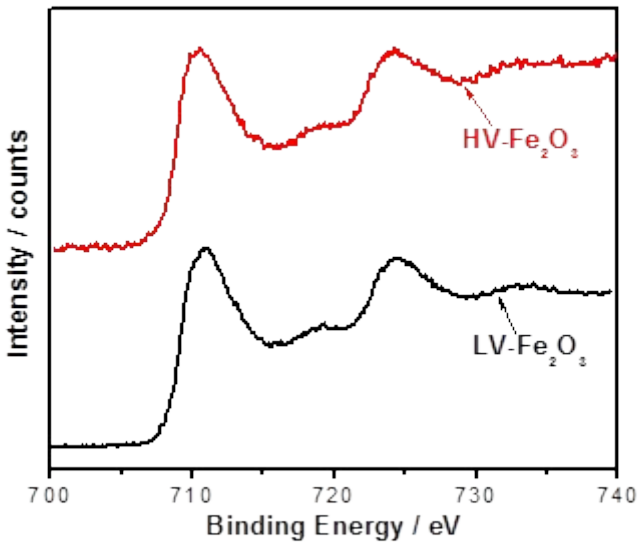

Figure S2. XPS spectra of Fe (2p) for bare HV-Fe_2O_3 and bare LV-Fe_2O_3 respectively.

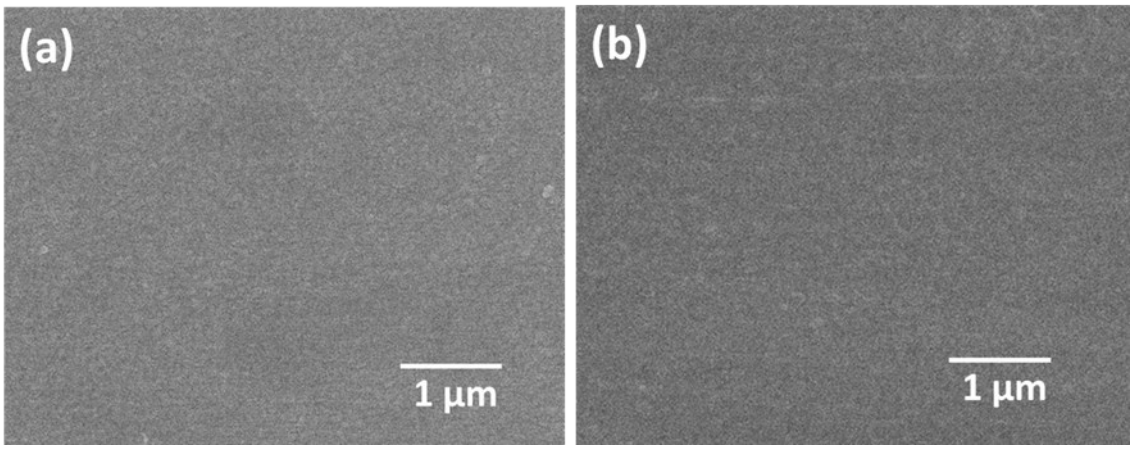

Figure S3. SEM for the surface view of HV-Fe_2O_3 (a) and LV-Fe_2O_3 (b) irradiated by the laser for 20 minutes.

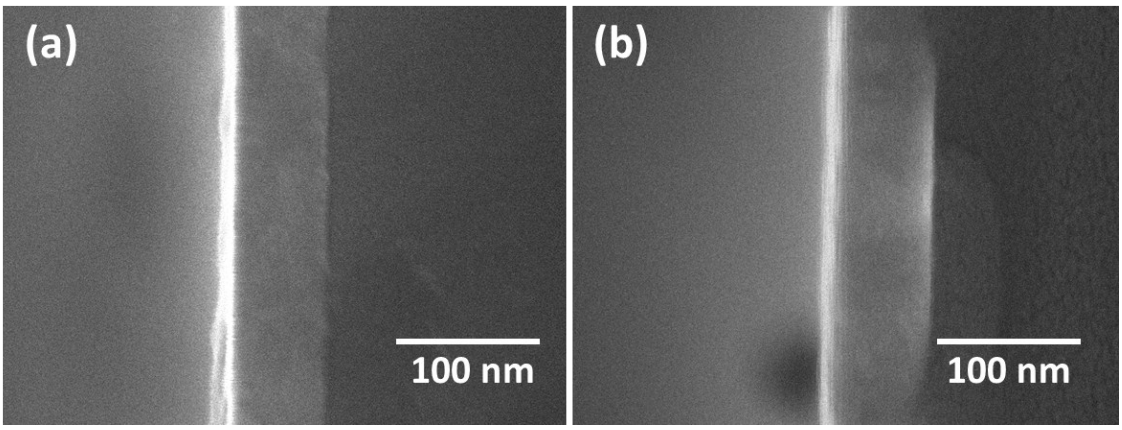

Figure S4. SEM for the cross view of HV-Fe_2O_3 (a) and LV-Fe_2O_3 (b) irradiated by the laser for 20 minutes. The thicknesses of them are about 70 nm.

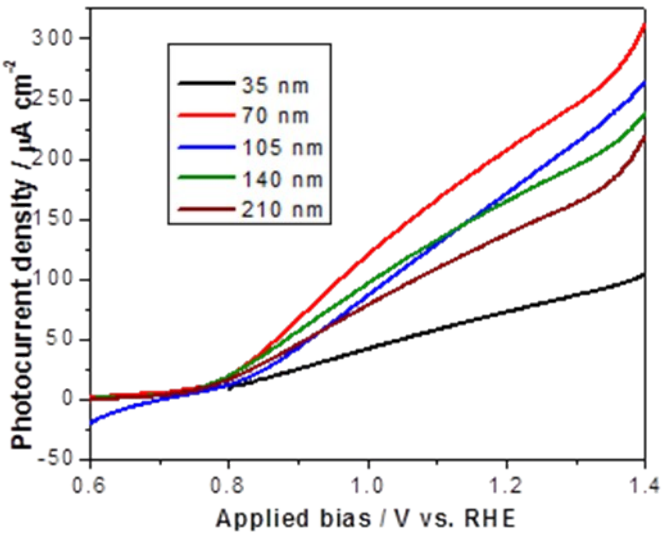

Figure S5. LSV curves for HV-Fe_2O_3 films with different thicknesses.

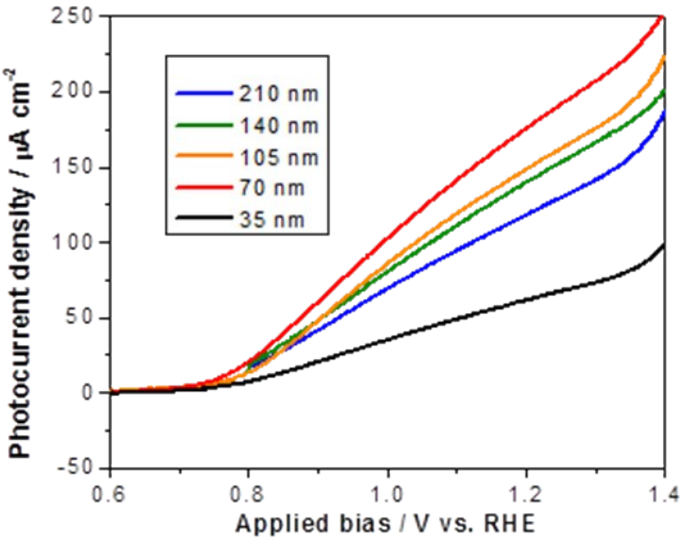

Figure S6. LSV curves for LV-Fe_2O_3 films with different thicknesses.

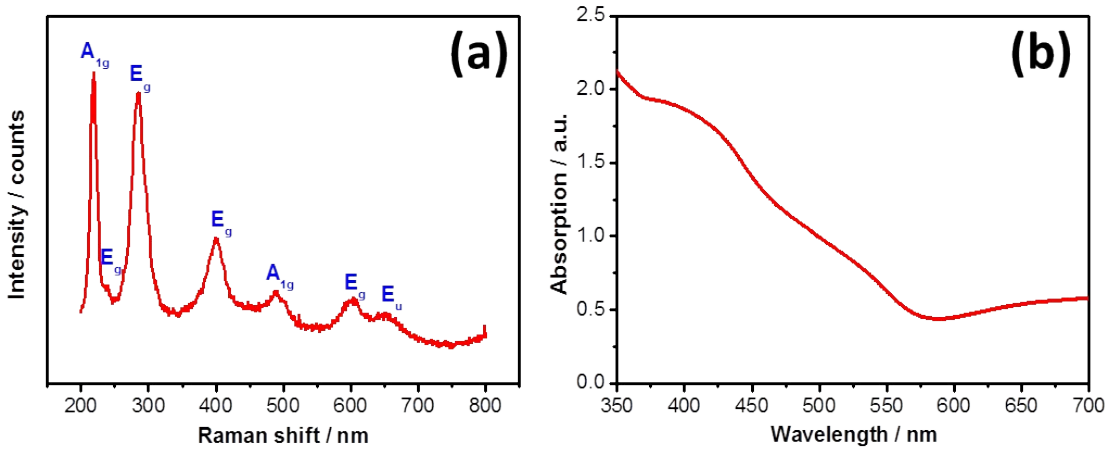

Figure S7. Raman shift (a) and UV-vis absorption spectra (b) of 140 nm HV/LV-Fe_2O_3 homojunction.

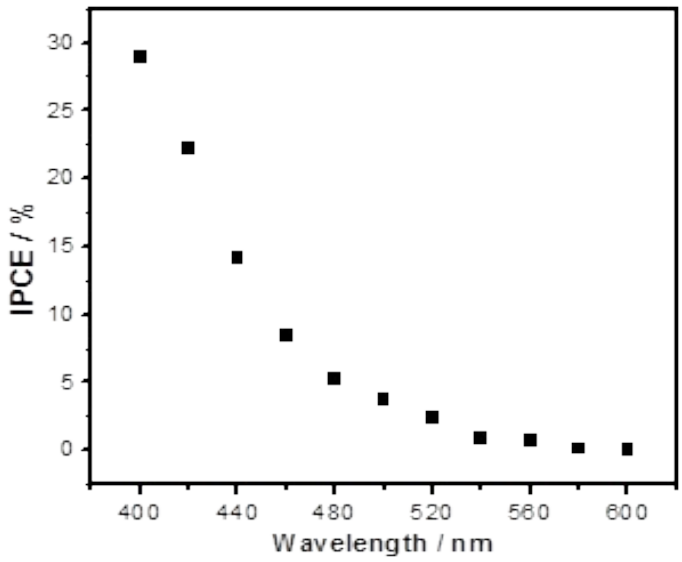

Figure S8. Incident photo-to-current conversion efficiency (IPCE) of the HV/LV-Fe_2O_3 homojunction.

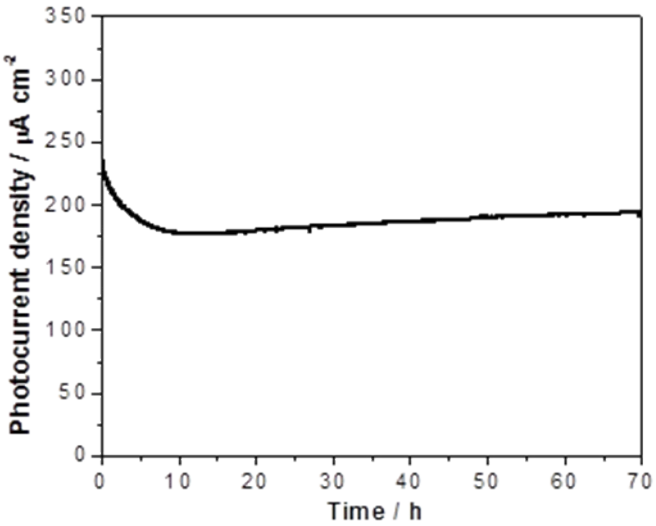

Figure S9. Long-time I-T curves of single HV-Fe_2O_3.

In the case of homojunction, the photocurrent density decreased only 7.8% after 73 hours. However, in the case of HV-Fe_2O_3, after only 10 hours, the photocurrent density has decreased 15.0%. This proved that the oxygen vacancies in HV-Fe_2O_3 had been stabilized and protected by the outside HV-Fe_2O_3 layer.

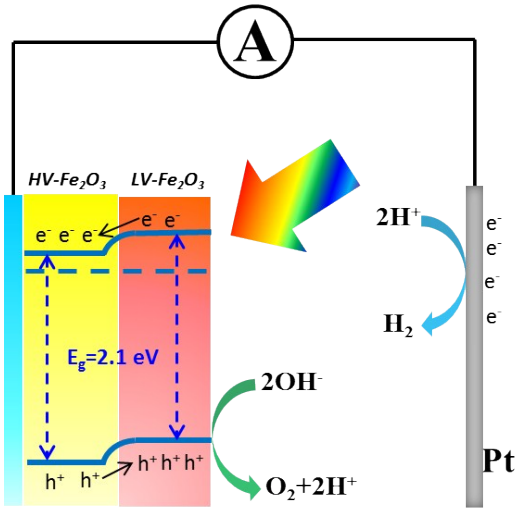

Figure S10. Schematic diagram for the solar water splitting process of hematite homojunction photoanodes.