Electronic supplementary information (ESI)

Photoelectrochemical Activity of ZnFe$_2$O$_4$ Modified α-Fe$_2$O$_3$ Nanorod Array Films

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Fig. S1. Spectral reflectance for pristine α-Fe$_2$O$_3$ and ZnFe$_2$O$_4$ modified α-Fe$_2$O$_3$ (ZFO-1 and ZFO-2) nanorod films.
Fig. S2. Spectral transmittance for pristine $\alpha$-Fe$_2$O$_3$ and ZnFe$_2$O$_4$ modified $\alpha$-Fe$_2$O$_3$ (ZFO-1 and ZFO-2) nanorod films.
The band gap can be determined from transmittance and reflectance spectra using the Tauc plot method as expressed in equation (1).\textsuperscript{1}

\[ \alpha h \nu = C(h \nu - E_g)^n \]  

(1)

where \( \alpha \) is the absorption coefficient, \( h \nu \) the photon energy, \( C \) the photon energy dependent constant, and \( E_g \) the band gap energy. Exponent \( n \) takes 1/2 and 2 for direct and indirect optical transition, respectively. In addition, the absorption coefficient \( \alpha \) can be expressed by equation (2).\textsuperscript{2}

\[ ad = \ln\left(\frac{T}{1 - R^2}\right) \]  

(2)

where \( d, T \) and \( R \) represent the thickness, transmittance, and reflectance of the films, respectively. Exponent \( n \) takes 2 because \( \alpha{\text{Fe}}_2\text{O}_3 \) is an indirect optical transition material. Fig. S3 shows the \((ah \nu)^{1/2}\) versus photon energy plot.

Fig. S3. Plots of \((ah \nu)^{1/2}\) versus photon energy of pristine \( \alpha{\text{Fe}}_2\text{O}_3 \) and ZnFe\textsubscript{2}O\textsubscript{4} modified \( \alpha{\text{Fe}}_2\text{O}_3 \) (ZFO-1 and ZFO-2) nanorod films.

References