Supplementary Information

**Critical Role and Modification of Surface States in Hematite Films for Enhancing Oxygen Evolution Activity**

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FIG. S1. 3-D surface topology images of (a) the pristine hematite, post-treated hematite with oxygen plasma for (b) 10 min, (c) 20 min, and (d) 30 min followed by the short annealing. Scanned area is 5 x 5 μm2.



FIG. S2. Absorption spectra of the samples used for transient absorption measurements.



FIG. S3. Transient absorption decays of the samples under 0.90 V vs. RHE bias, (a) at 575 nm and (b) at 650 nm.



FIG. S4. Transient absorption decays of the samples under 1.23 V vs. RHE bias, (a) at 575 nm and (b) at 650 nm.



FIG. S5. Fe 2p XPS spectra of hematite films; pristine (black), treated with Ar plasma (red), and Ar plasma followed by short annealing (blue)