Electronic Supporting Information

Nanostructured WO_3 photoanodes for efficient water splitting via anodisation in citric acid

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All data created during this research are openly available from the University of Bath data archive at https://doi.org/10.15125/BATH-00418

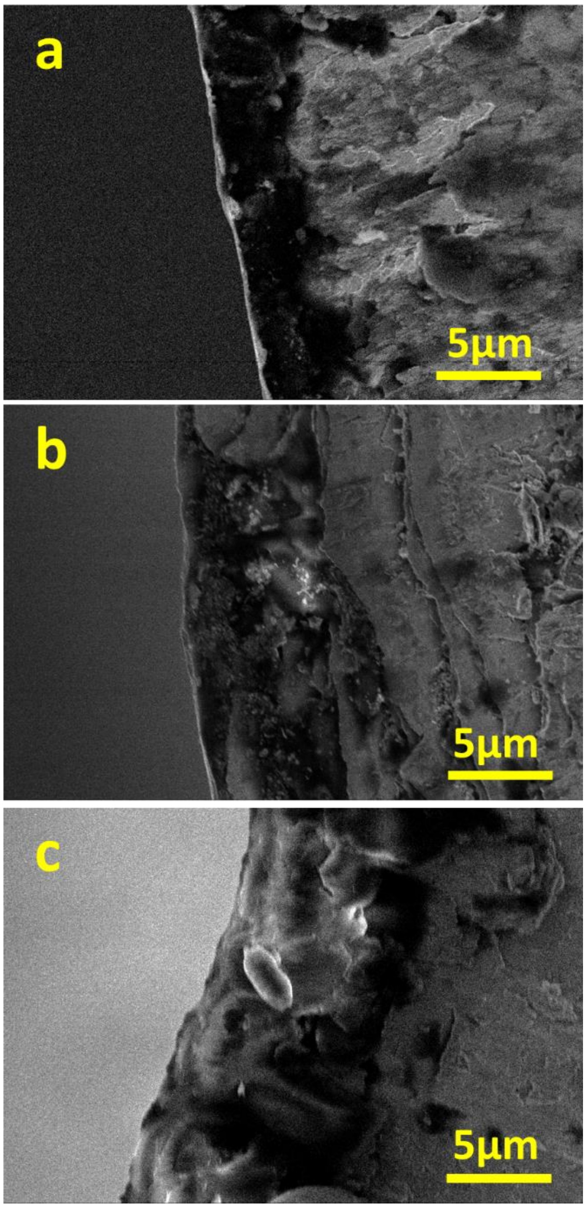

Figure S1. Representative cross sectional FESEM images for WO_3 photoanodes produced in CA/H_2O at 0.1 A for 30 min (a), in CA/NMF/H_2O at 0.015 A for 30 min (b), and in NH_4F/NMF/H_2O at 40 V for 6 h (c). The average thicknesses of each film are 3.7±1.5, 5.8±1.7 and 7.4±2.7 µm, respectively. Cross-sections were prepared by cutting the photoanodes with tongs.

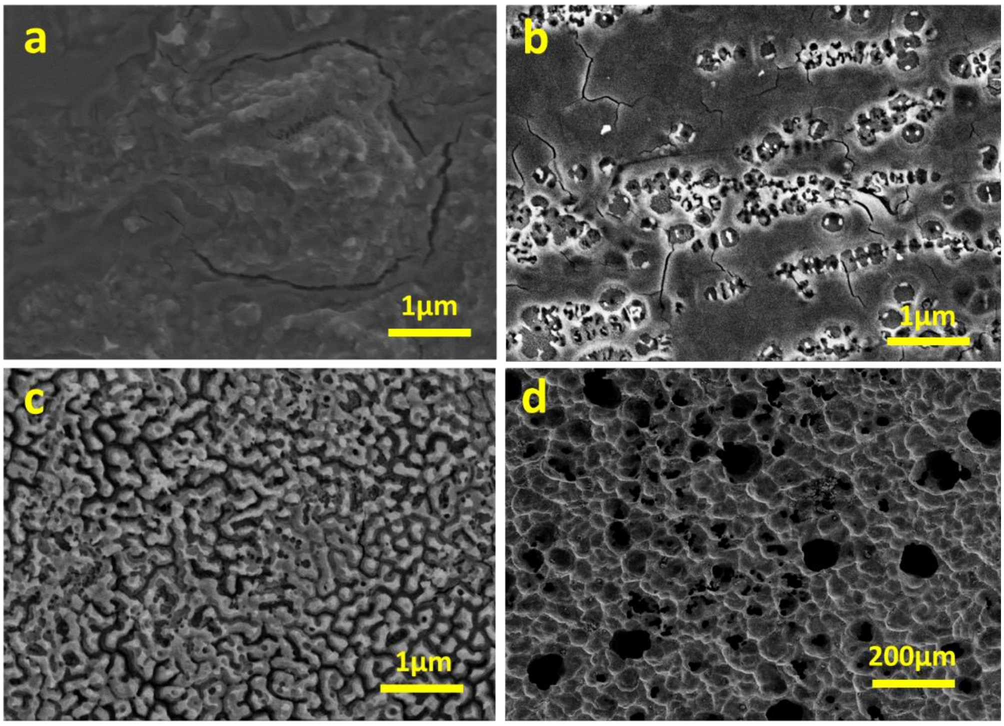

Figure S2. FESEM micrographs of the morphological transformation of WO_3 layer anodised in CA/H_2O at 0.10 A. (a) Compact oxide layer with cracks forms in a few minutes; (b) field assisted dissolution gradually induces holes mainly along cracks; (c) canyon-like structures composed of nanorods/nanowalls spreads uniformly after anodisation for ca. 30min; (d) pitting corrosion takes place after long anodisation time (>30min).

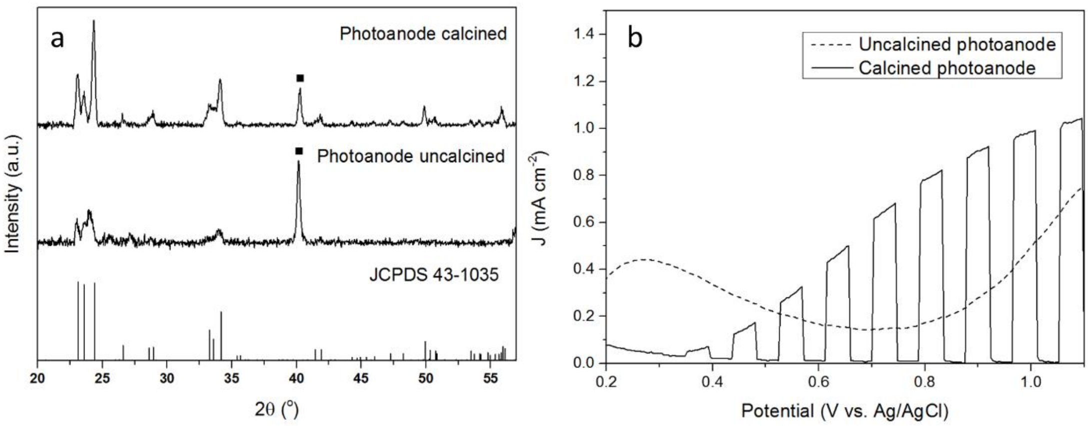

Figure S3. (a) XRD patterns of calcined and uncalcined WO_3 electrodes prepared by anodisation in CA/H_2O at 0.10 A for 30 min and (b) their current densities under chopped solar simulated light (AM1.5, 100 mWcm^{-2}). Squares indicate diffraction from metallic tungsten (110) under WO_3.

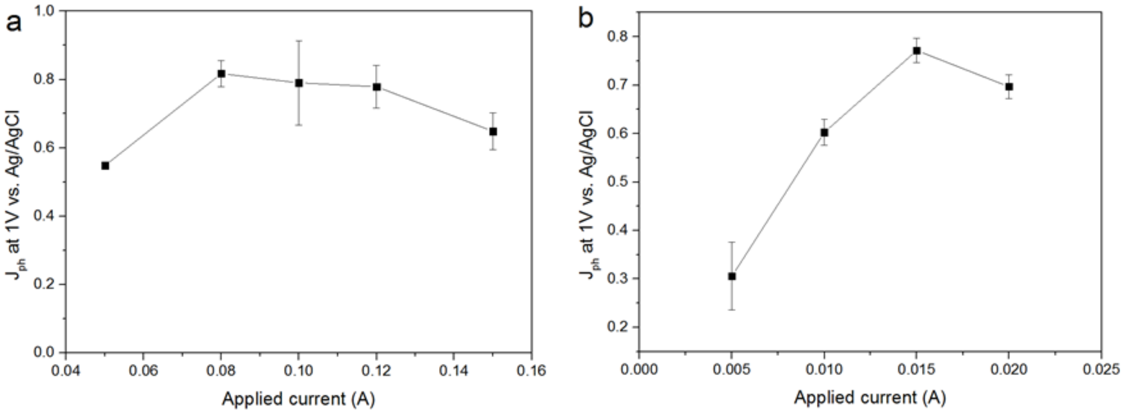

Figure S4. Photocurrent density measured at 1.0 V vs. Ag/AgCl in 0.5 M H_2SO_4 under 1 sun illumination (AM1.5G, 100 mW cm^{-2}) for WO_3 photoanodes produced with CA/H_2O (a) and CA/NMF/H_2O (b) solutions for 30 min; the optimised anodising currents were found to be 0.10A and 0.015A, respectively.