Supplementary Information

Photoelectrochemical deposition of CoP on cuprous oxide photocathodes for solar hydrogen production

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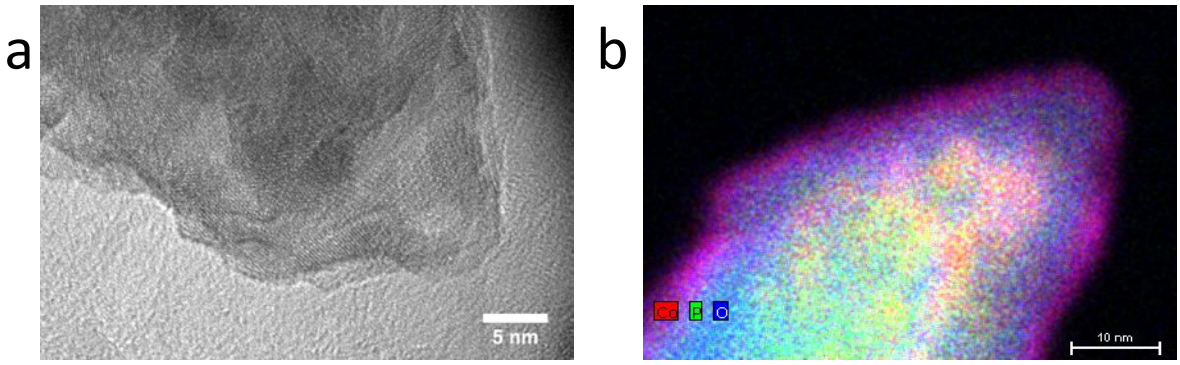

Fig. S1 HRTEM image of the electrodeposited CoP catalyst on Cu foils. a) High-resolution TEM image of the catalytic sample after HER catalysis. The sample was scraped off from the copper foil substrate. b) Corresponding EDX elemental mapping of the sample shown in a). The EDX confirms homogenous dispersion of the elements after HER (red for Co, green for P, and blue for O). The cobalt oxide layer surrounding the sample is attributed to air oxidation after water reduction.

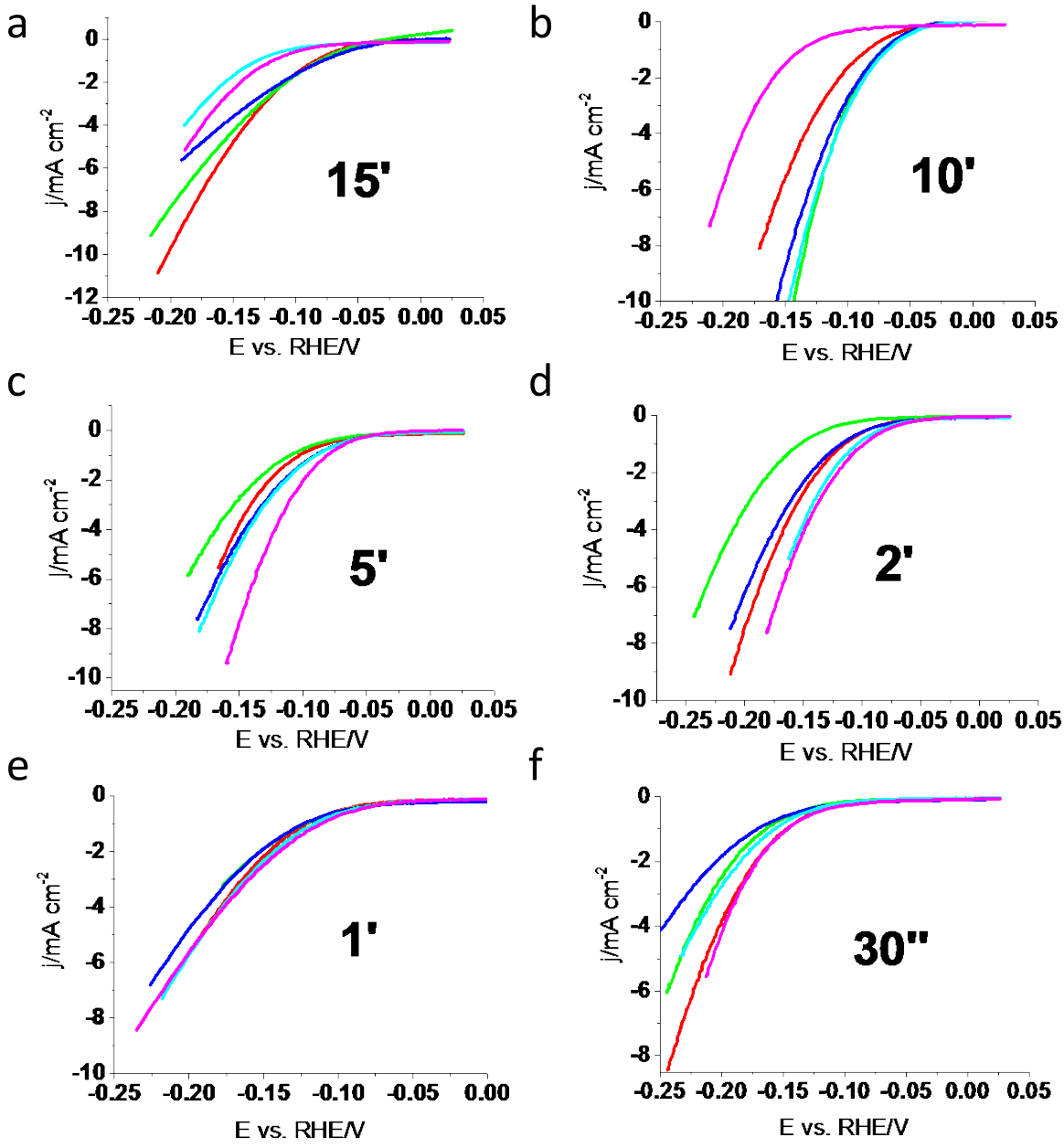

Fig. S2 Detailed polarization scans corresponding to the HER activity of CoP films on FTO under different deposition conditions. Each scan colour is associated with a specific deposition potential indicated underneath the graphs. (a) 15 minutes deposition. (b) 10 minutes deposition. (c) 5 minutes deposition. (d) 2 minutes deposition. (e) 1 minute deposition. (f) Deposition of 30 seconds. All measurements are under steady state conditions. Conditions: 5 mV s^{-1} scan rate, 0.5 M H_2SO_4.

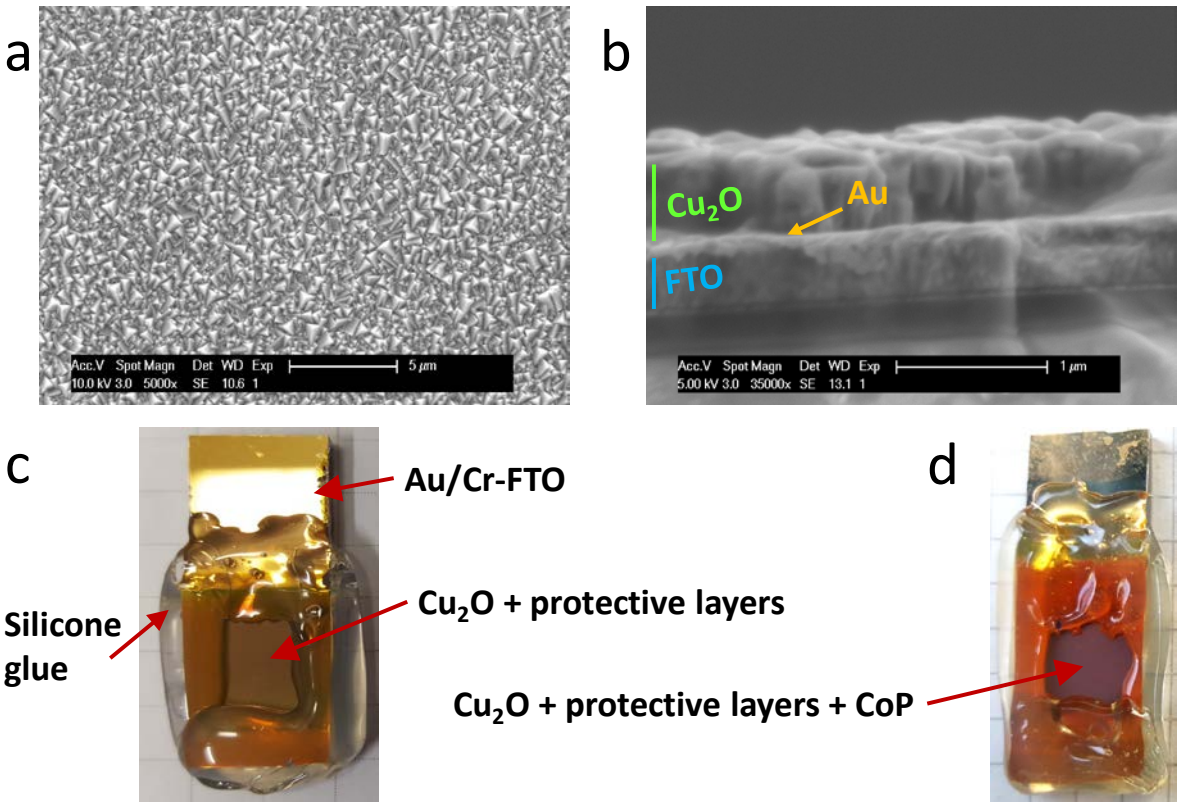

Fig. S3 Microscopic and optical images of the photo-electrode assembly prior to and after photodeposition of the catalyst. (a) and (b) SEM images of the layered assembly prior to atomic layered deposition of the protective layers. (a) Top-view. (b) Cross-section view with indication of the layers' nature. (c) Optical photography of a photocathode without co-catalyst. (d) Optical photography of a photocathode after CoP photodeposition.

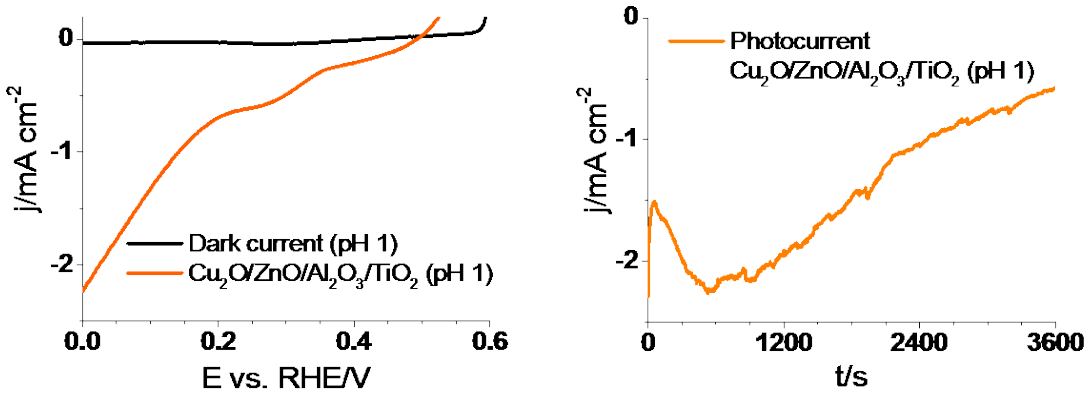

Fig. S4 . Catalyst-free photoelectrodes for solar hydrogen production. (a) The orange curve represents the activity of the Cu_2O photoelectrode with AZO/TiO_2 protective layers but without any catalyst. (b) Corresponding potentiosatic curves at 0 V over the course of 1 hour. The feature observed at approximatively 600 seconds is attributed to gas bubble removal from the photoelectrode surface. Catalytic test conditions: 10 mV s^{-1} scan rate, 0.1 M H_2SO_4, no iR drop correction, Xenon lamp irradiation of 100 mW cm^{-2} (1.5 AM).