

Electronic supplementary material.

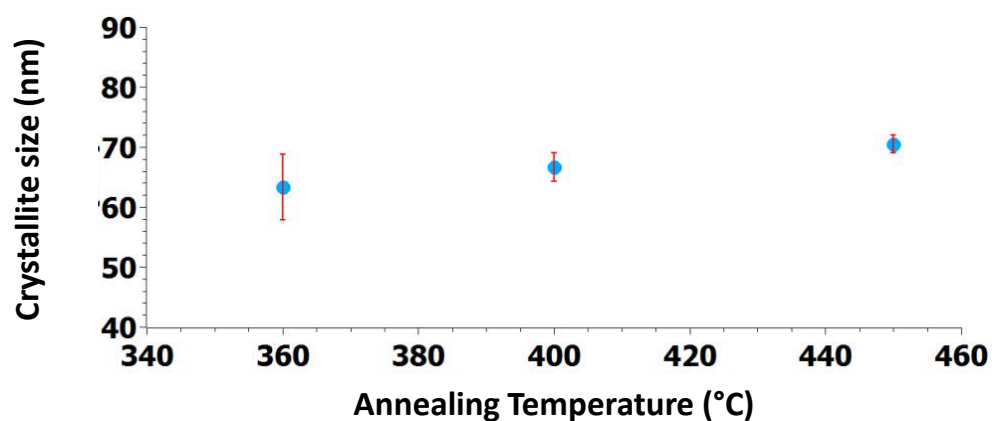


Fig. SI1. Evolution of the crystallite size as a function of the annealing temperature for CuO photoelectrodes.

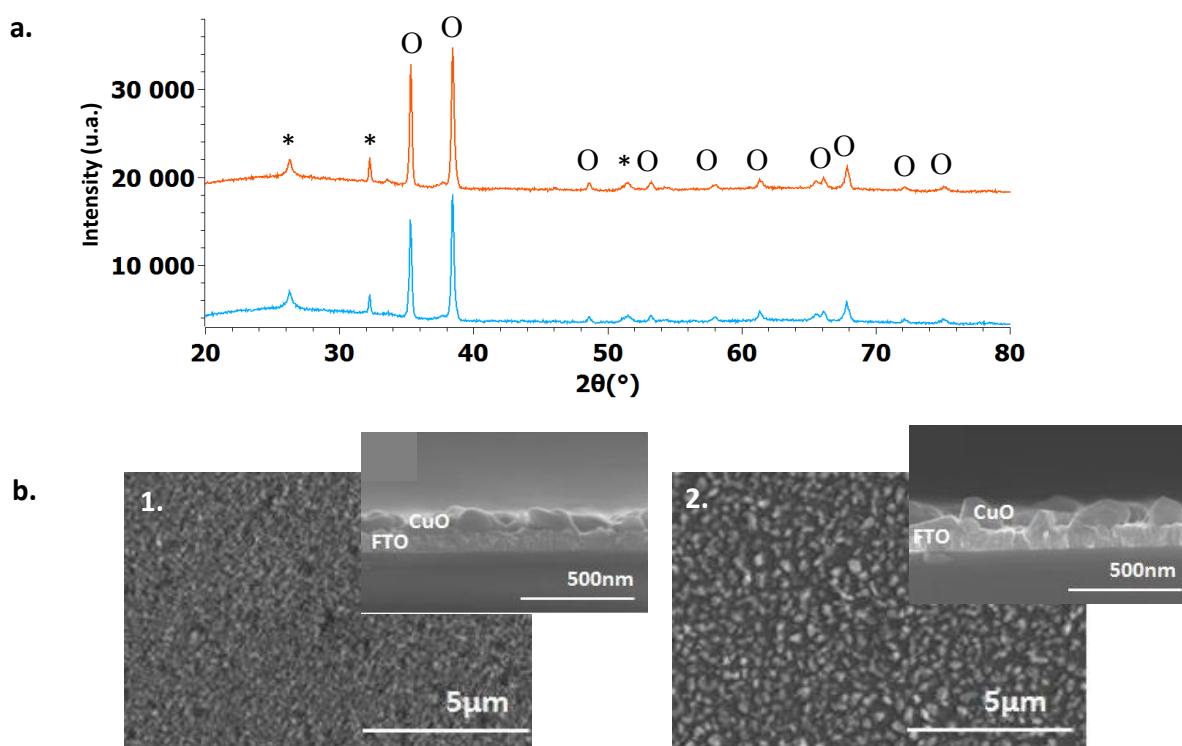


Fig. SI2. (a) XRD patterns for dense (blue) and mesoporous (orange) photoelectrodes (* signs indicate underlying SnO_2 and O signs correspond to CuO phase). (b) SEM images for dense (1) and mesoporous (2) photoelectrodes (Inset. Cross-section of the respective photoelectrodes). Annealing temperature is 400°C in air for 20 min. The sol concentration was 0.3 mol.L^{-1} .

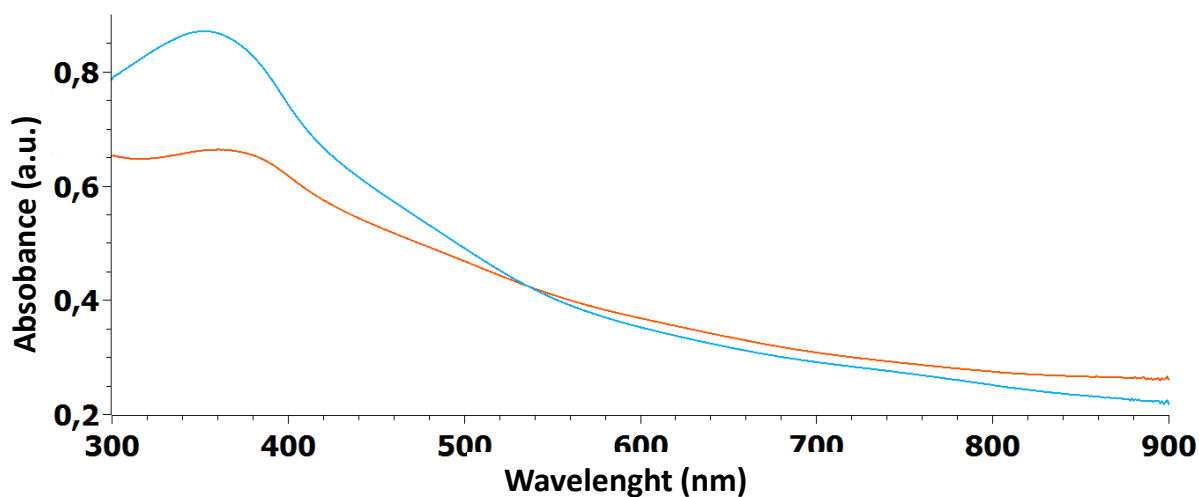


Fig. SI3. UV-visible diffuse reflectance spectra for dense (blue) and mesoporous (orange) photoelectrodes annealed at 400°C in air for 20 min. The sol concentration was 0.3 mol.L⁻¹.

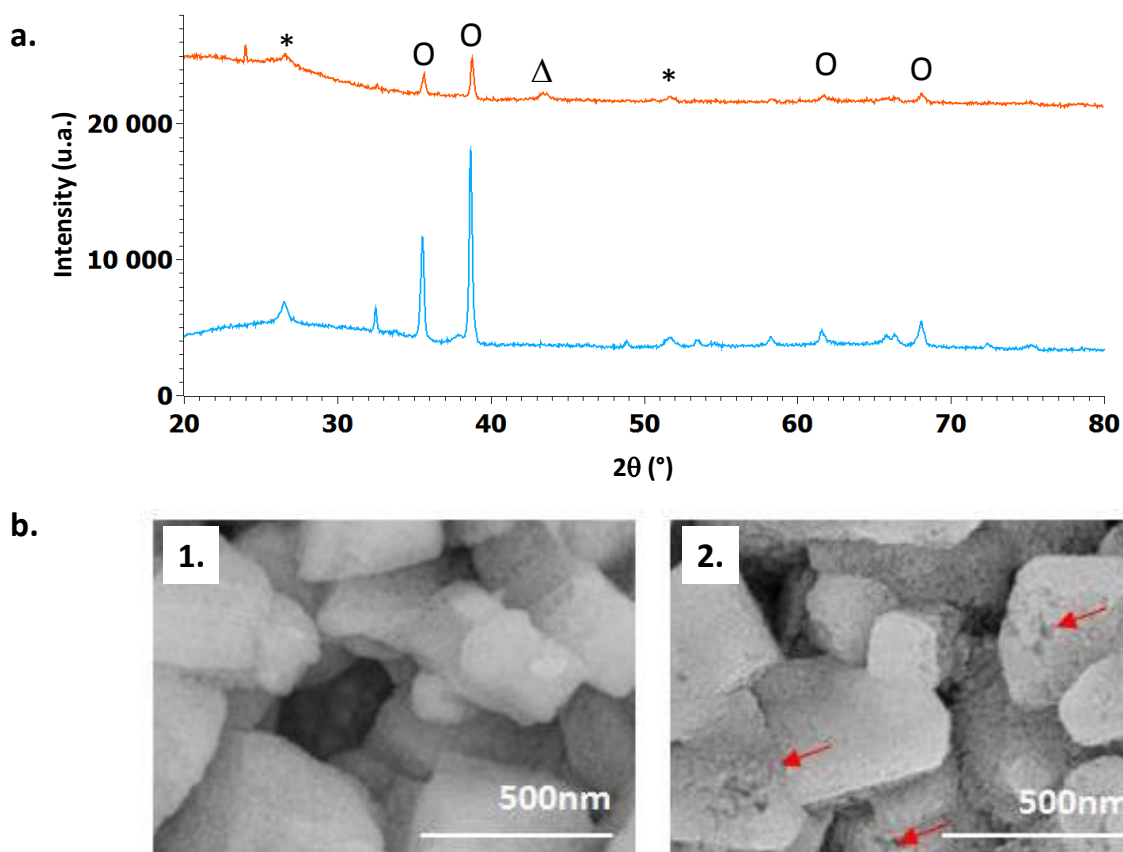


Fig. SI4. (a) XRD patterns for 400-CuO photoelectrodes before (blue) and after (orange) photoelectrochemical testing (*: SnO₂, O: CuO and Δ: Cu phases), SEM images (b) of *protected* (1) and *unprotected* (2) zones for dense photoelectrodes after photoelectrochemical testing. Red arrows indicate the preferential zones where Cu dissolution is observed. Annealing temperature is 400°C under air for 20 min. The sol concentration was 1.5 mol.L⁻¹.

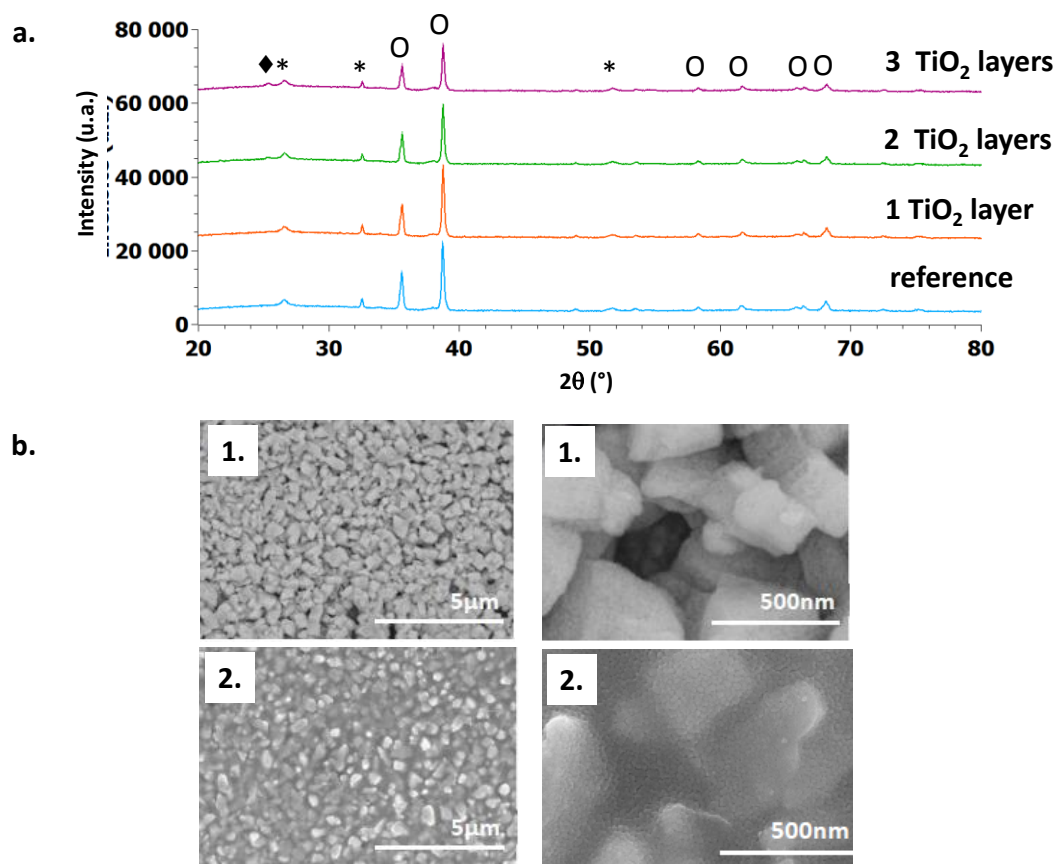


Fig. SI5. (a) XRD patterns for 400-CuO bare photoelectrodes ($C = 1.5 \text{ mol.L}^{-1}$) before and after the deposition of $n\text{-TiO}_2$ layers (*: SnO_2 , O: CuO and ♦: TiO_2 , $n=1-3$), (b) SEM images of CuO bare photoelectrodes (1) and protected CuO photoelectrodes by 2 TiO_2 layers (2). Annealing temperature is 500°C under air for 1 h. The sol concentration was 1.5 mol.L^{-1} for CuO and 0.3 mol.L^{-1} for TiO_2 .

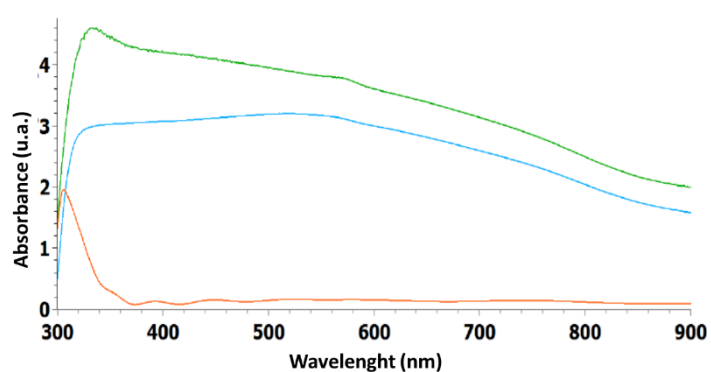


Figure SI6. Absorbance as function of the wavelength for 2-layers TiO_2 films (orange), 2-layers CuO films (green) and TiO_2 -protected CuO films (blue).

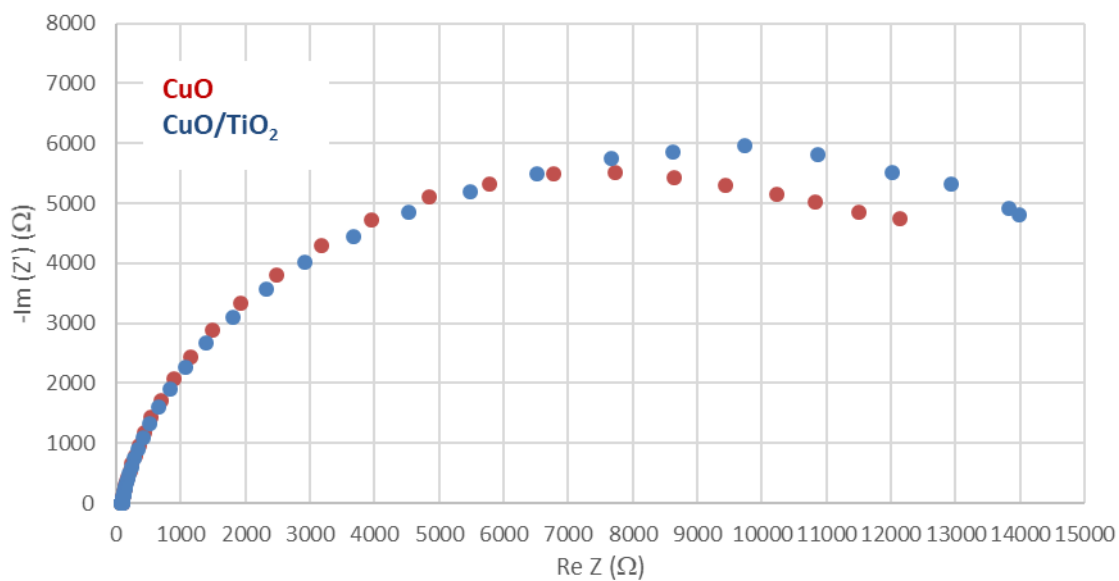


Figure SI7. Nyquist plots of electrochemical impedance spectra for CuO (red) and CuO/TiO₂ (blue) in light conditions at pH = 6 and 0 V vs. RHE. Measurements from 200 kHz to 0.1 Hz.

Sample	CuO	CuO/TiO ₂
Photocurrent (mA/cm ²), t = 200s	- 0.94	- 0.5
Photocurrent (mA/cm ²), t = 600s	- 0.87	- 0.5
Stability (%) J ₆₀₀ /J ₂₀₀	92	100

Table. S1. Photocurrent values of 400-CuO with and without protective TiO₂ layer, 0 V vs. RHE for pH=7-8.