

Photoelectrochemical and Structural Insights of Electrodeposited CeO₂ Photoanodes

Support information

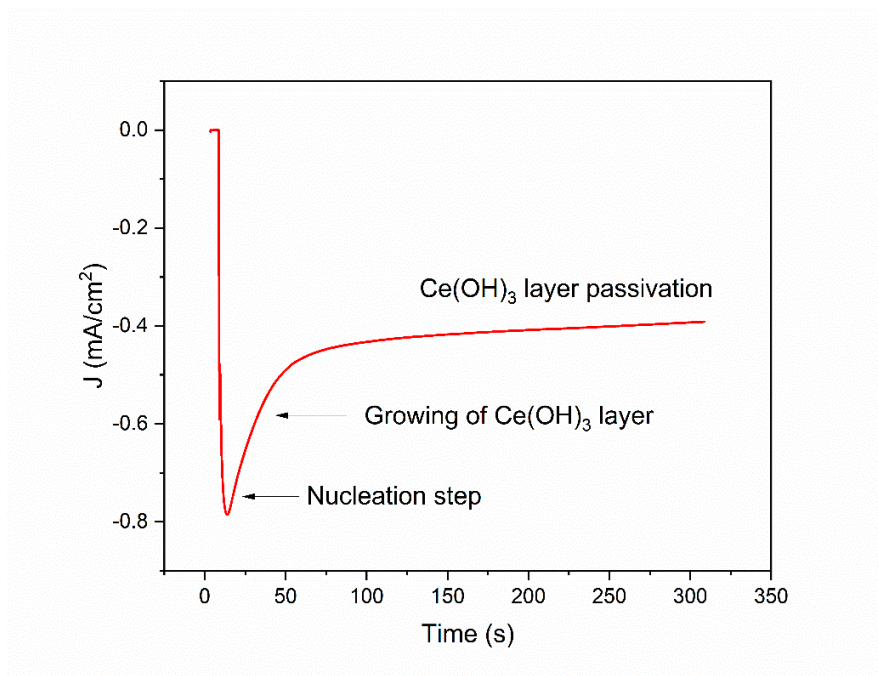


Figure S1. Chronoamperometry for the electrodeposition of Ce-based photoanodes (-1.2 V vs. Ag/AgCl). The synthesis solution was 25 mM CeCl₃ and 50 mM NaNO₃ at pH 4.5

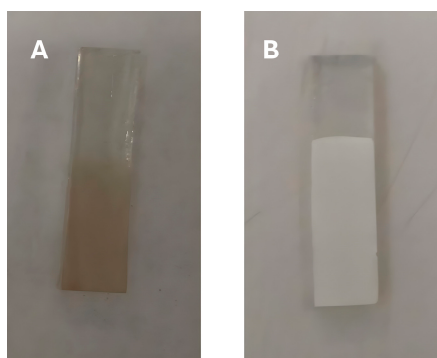


Figure S2. (A) Ce(OH)₃ electrodeposited on FTO substrate (immediately after electrosynthesis). (B) CeO₂ layer obtained after annealing at 600 °C.

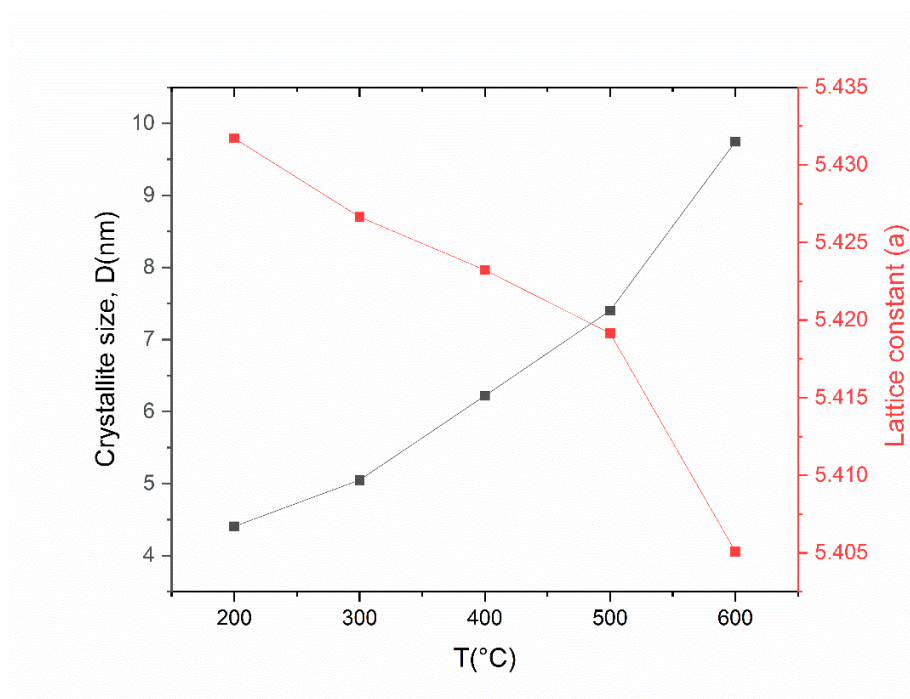


Figure S3. Change in crystallite size and lattice constant (*a*) with annealing temperature of electrodeposited CeO_2 layers on FTO.

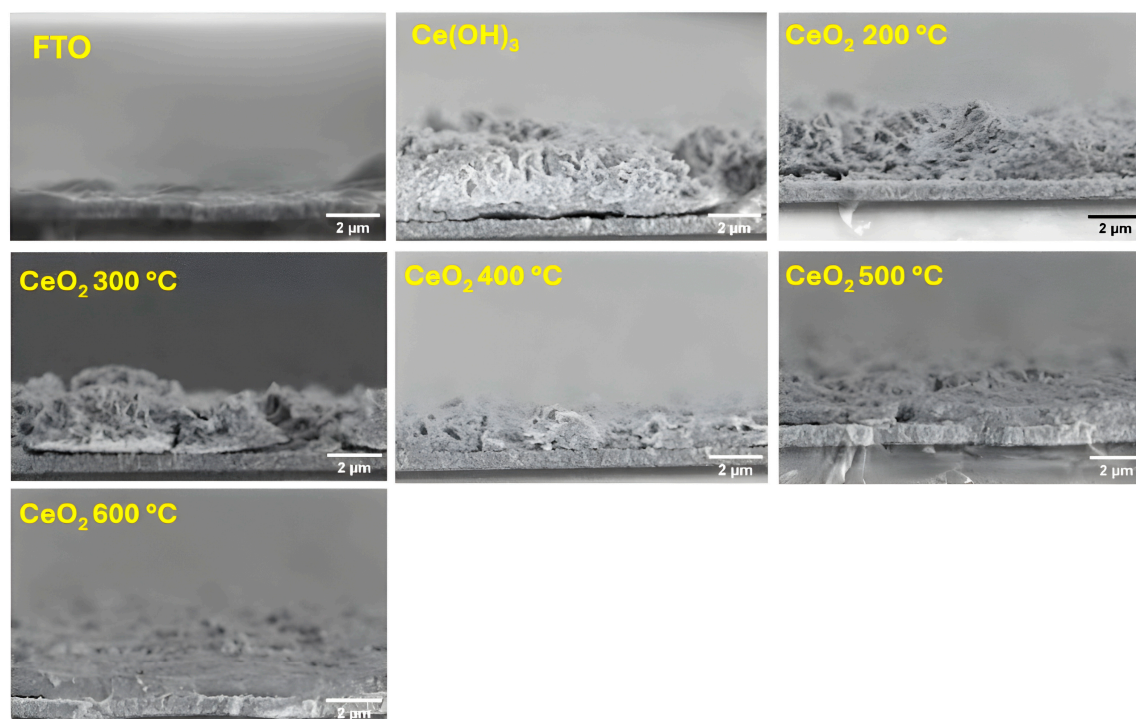


Figure S4. SEM Cross-sectional images of coatings on FTO. Ce(OH)_3 layer was obtained by electrodeposition and CeO_2 was obtained from Ce(OH)_3 by annealing at different temperatures.

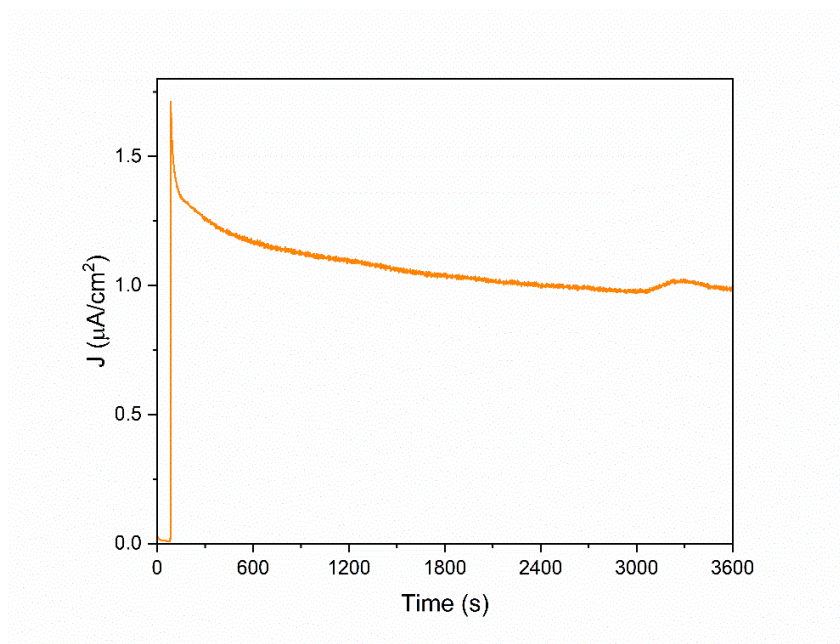


Figure S5. Curve I-t of CeO₂ photoanode annealed at 600 °C. The measurements were performed at 1.2 V (vs. Ag/AgCl) (1.8 V vs RHE) for 3600 s in a 0.1 M Na₂SO₄ solution. (100 mW/cm²).

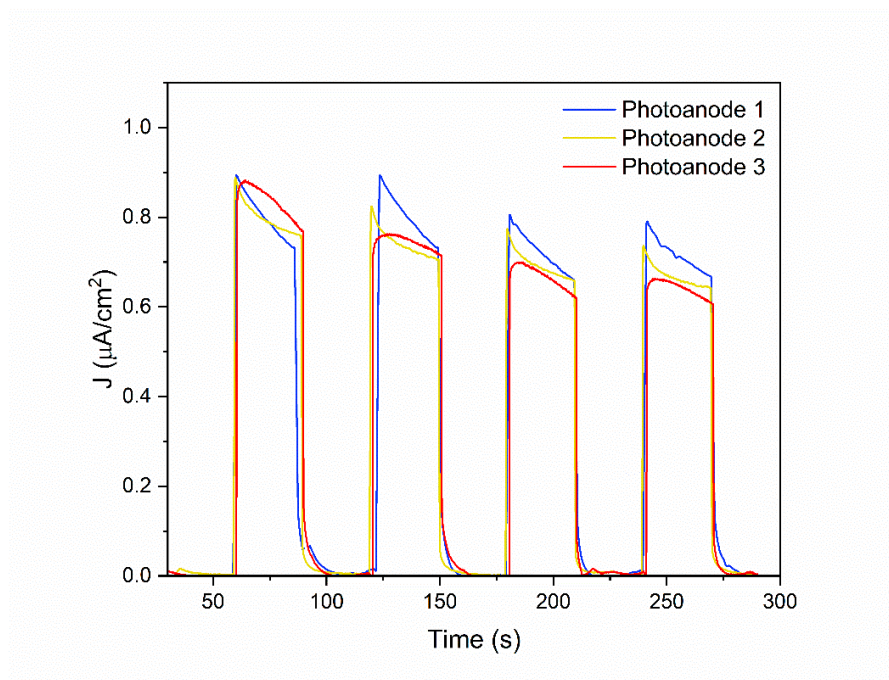


Figure S6. Chopped photocurrent produced by CeO₂ photoanodes annealed at 600 °C. The measurements were performed at 1.2 V (vs. Ag/AgCl) in a 0.1 M Na₂SO₄ solution and 100 mW/cm².

Photoelectrode	Average thickness \pm SD (μm)
Ce(OH) ₃	2.9 ± 0.3
CeO ₂ – 200 °C	2.4 ± 0.4
CeO ₂ – 300 °C	2.3 ± 0.2
CeO ₂ – 400 °C	1.6 ± 0.2
CeO ₂ – 500 °C	0.84 ± 0.15
CeO ₂ – 600 °C	0.84 ± 0.098

Table S1. Average thicknesses of CeO₂ coatings on FTO annealed at different temperatures. Each mean value and its standard deviation was calculated from ten measurements taken from the cross-sectional SEM image of the coating.

Photoanode	Step 1(ΔJ) ($\mu\text{A}/\text{cm}^2$)	Step 2(ΔJ) ($\mu\text{A}/\text{cm}^2$)	Step 3(ΔJ) ($\mu\text{A}/\text{cm}^2$)	Step 4(ΔJ) ($\mu\text{A}/\text{cm}^2$)	ΔJ_{total} ($\mu\text{A}/\text{cm}^2$)
200	0.03	0.02	0.01	0.01	0.01
300	0.01	0.01	0.02	0.01	0.02
400	0.02	0.005	0.01	0.01	0.02
500	0.05	0.03	0.03	0.03	0.10
600	0.14	0.12	0.10	0.09	0.12

Table S2. Drops in the photocurrent (ΔJ) during each stage of illumination (steps). The CeO₂ photoanodes were obtained at different annealing temperatures.