Supporting information

Porous calcium copper titanate electrodes for paracetamol degradation by electro-oxidation via CuO-induced peroxymonosulfate activation

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S1. Characterization of the synthesized nanocomposites

The pellet surface morphology was analyzed using a Hitachi S4800 scanning electron microscope (SEM) and a three-dimensional (3D) optical microscope (VHX-7000, KEYENCE, Osaka, Japan). Elemental mapping and the crystalline phase were determined using a Zeiss EVO HD15 microscope with an Oxford X-MaxN EDX detector, and a PANAlytical Xpert-PRO diffractometer with an Xcelerator detector using Ni-filtered Cu-radiation with a wavelength of 1.54 Å (scan step size = 0.0020889°/step, time per step = 200.660 sec, and 2θ = 20°–80°), respectively. The electrode phase composition was determined using Rietveld refinement and the FullProf software[47] with the profile function 7. LaB_6 structure refinement was used as standard to obtain the instrument resolution function. Raman spectra and mapping images were recorded using dispersive Raman spectroscopy (HORIBA LABRAM, λ = 659 nm). The laser power was fixed at 20 W with the following acquisition conditions: continuous mode of 10 s, snapshot time of 7 s, and 2.5 accumulations set to 30 times. The pellet surface

elemental composition and the pellet porosity were determined by X-ray photoelectron spectroscopy (XPS) using a monochromatic X-ray source (Al-Kα, 1486.6 eV – Resolution FWHM 0.45 eV), and mercury porosimetry (Quantachrome Autoscan 500 porosimeter), respectively. Room-temperature continuous wave (cw) Electron Paramagnetic Resonance (EPR) measurements were carried out at X-band frequencies (9.78 GHz) using a Bruker B-ER420 spectrometer upgraded with a Bruker ECS 041XG microwave bridge and a lock-in amplifier (Bruker ER023M) that relies on a Bruker TE_{102} resonator with modulation amplitude of 1 G, modulation frequency of 100 kHz, and attenuation of 30 dB for the microwave power. Samples were measured in 2.9 mm outer diameter quartz tubes (filling height of ~10 mm) that contained 0.08-0.09 g powdered sample. The optical properties were studied using photoluminescence and an optical fiber spectrometer (Ocean Optics usb2000) after excitement with a nitrogen Nd:YAG laser (266 nm, 10 mW, 1 kHz) in the 350–900 nm range.

S2. Toxicity test

V. fischeri was reconstituted by adding 5 mL of reagent diluent at 5 °C. Then, the reagent was stabilized by transferring 200 µL of the solution to the cuvettes at 15 °C for 15 min. V. fischeri bacteria were activated by adding 22% NaCl solution to the mixture to dilute the initial sample concentration to 0.27%. This dilution was selected to increase the bioluminescence measurement sensitivity and the detection of acute toxicity, even at extremely low concentrations of toxic compounds. Indeed, V. fischeri activity and consequently luminescence can be decreased by toxic compounds present in the solution.

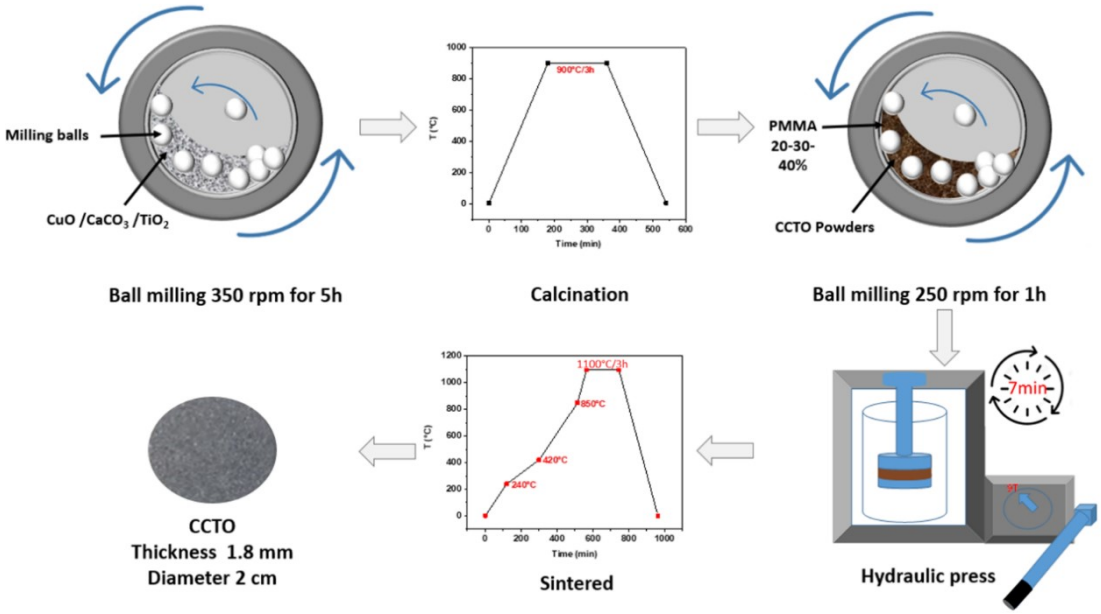

Figure S1. Schematic illustration the production of CCTO samples using different amounts of PMMA as pore-forming agent.

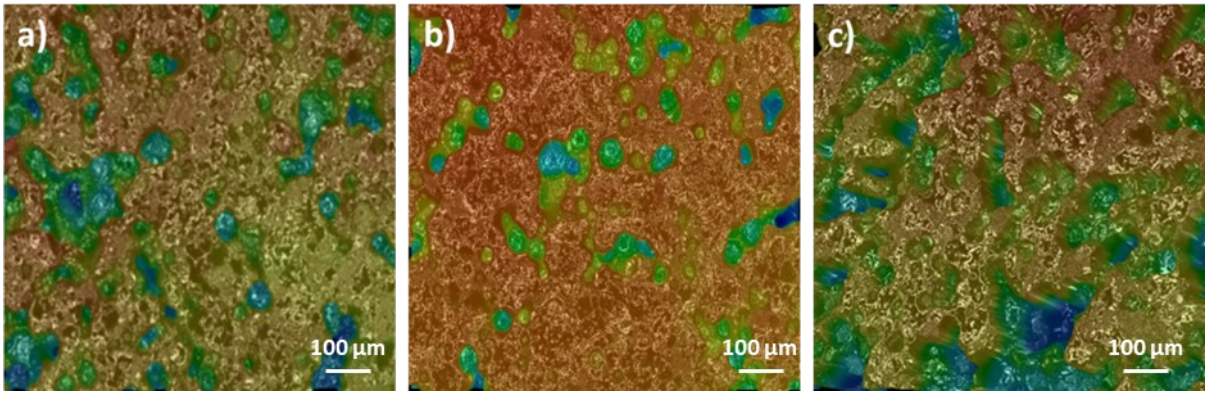

Figure S2. 3D optical microscopy images of a) CCTO-20, b) CCTO-30, and c) CCTO-40.

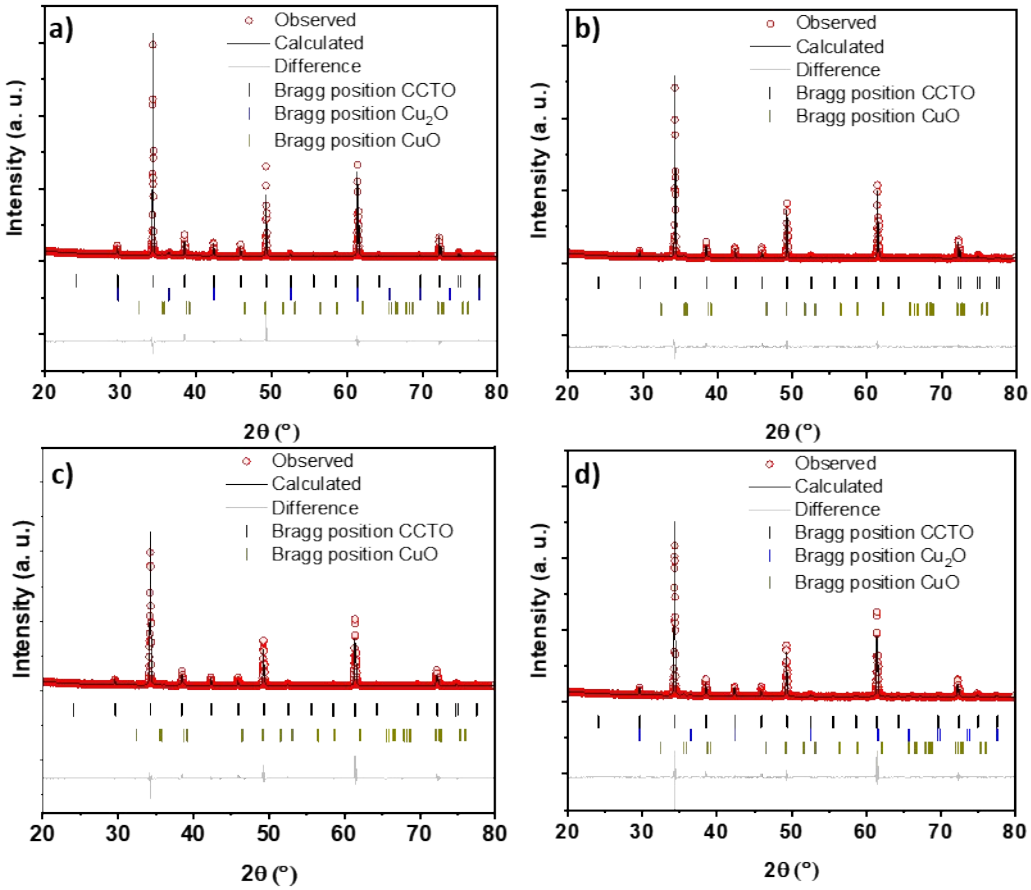

Figure S3. Structure refinement analysis based on the room-temperature XRD data for a) CCTO, b) CCTO-20, c) CCTO-30, and d) CCTO-40 powdered samples obtained by grinding the sintered pellets.

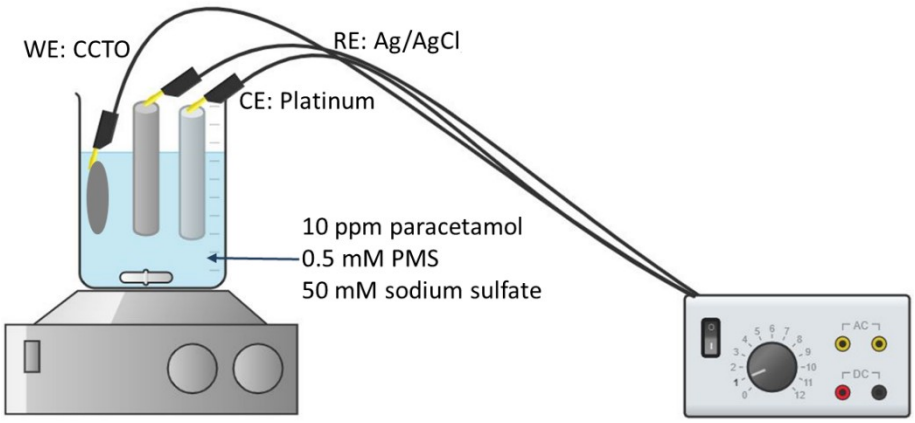

Figure S4. Electrocatalysis process. WE: working electrode; RE: reference electrode; CE: counter electrode.