

Supporting Information

Spinel Cobalt Titanium Binary Oxide as an All-Non-Precious Water Oxidation Electrocatalyst in Acid

Sengeni Anantharaj,^{[a],[b]} Kannimuthu Karthick,^{[a],[b]} and Subrata Kundu^{*[a],[b]}

^[a]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad-201002, Uttar Pradesh, India.

^[b]Materials Electrochemistry Division (MED), CSIR-Central Electrochemical Research Institute (CECRI), Karaikudi-630006, Tamil Nadu, India.

* To whom correspondence should be addressed, *E-mail:* skundu@cecri.res.in; kundu.subrata@gmail.com, Phone: (+ 91) 4565-241486 and (+ 91) 4565-241487.

EXPERIMENTAL

Reagents and Instruments

Cobalt (II) chloride, Titanium (III) Chloride in HCl, Iridium oxide and potassium hydroxide were procured from Sigma-Aldrich. Sulphuric acid was purchased from RANKEM industries. Hg/HgO reference electrode was purchased from CH Instruments Pvt. Ltd. Deionized water (18 M Ω) was used for the entire synthesis and electrocatalysis processes. The synthesized spinel Co₂TiO₄ was characterized with HR-TEM, (TecnaiTM G² TF20) working at an accelerating voltage of 200 kV. The XRD analysis was done with a scanning rate of 5° min⁻¹ in the 2 θ range 10-90° using a Bruker X-ray powder diffractometer (XRD) with Cu K α radiation (λ = 0.154 nm). X-ray photoelectron spectroscopic (XPS) analysis was performed using a Theta Probe AR-XPS system (Thermo Fisher Scientific, UK). The spinel Co₂TiO₄ modified carbon cloth (CC) was used as working electrode and a blank carbon cloth with large geometrical surface area (1.5 \times 3 cm) was used as a counter electrode. CH Instrument model number CHI6804c was used for entire electrochemical studies.

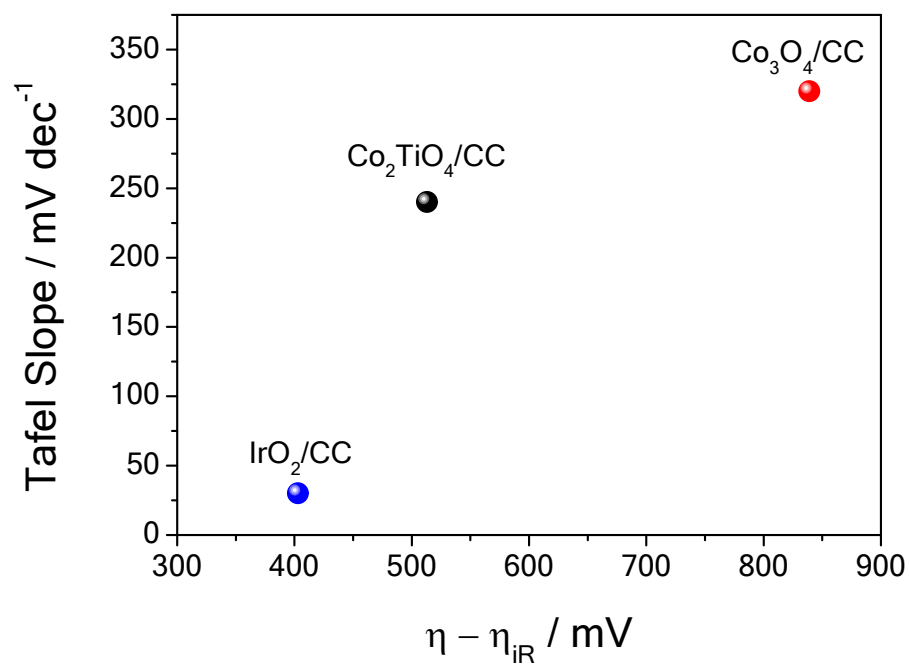


Fig. S1: Plot of overpotential vs. Tafel slope of $\text{Co}_2\text{TiO}_4/\text{CC}$ interface in 0.5 M H_2SO_4 .

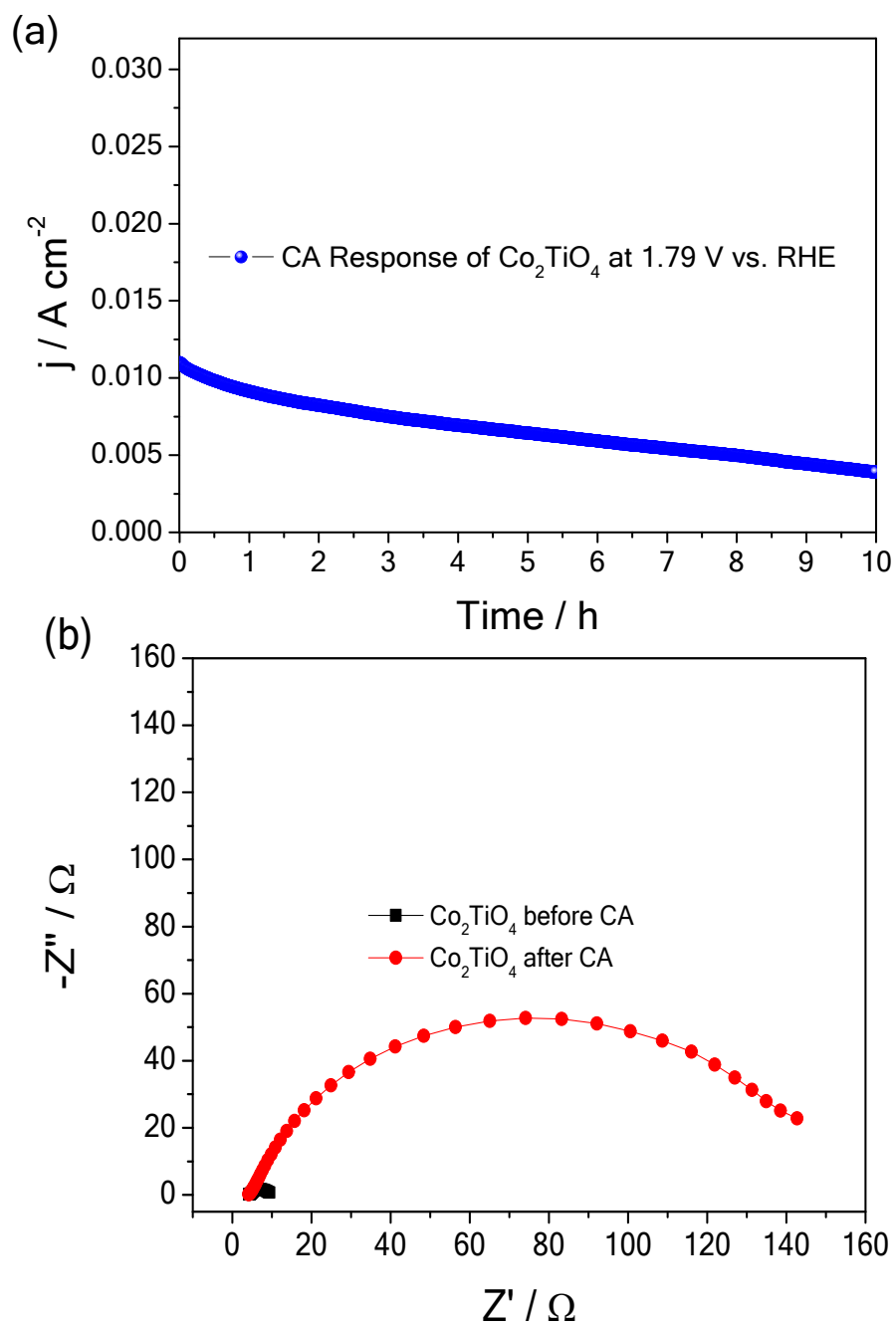


Fig S2: (a) Chronoamperometric response of $\text{Co}_2\text{TiO}_4/\text{CC}$ at 1.79 V vs. RHE. (b) The Nyquist plots of the same before and after chronoamperometric analysis.

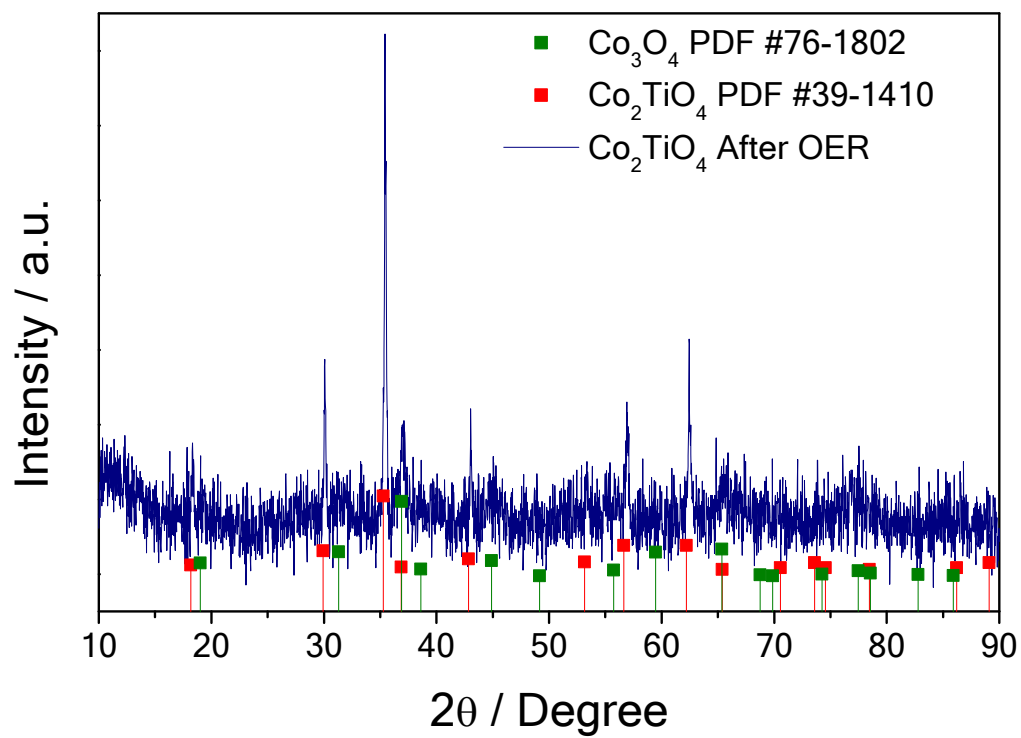


Fig. S3: XRD pattern of Co₂TiO₄ after OER studies showing the presence of Co₃O₄ along with Co₂TiO₄.

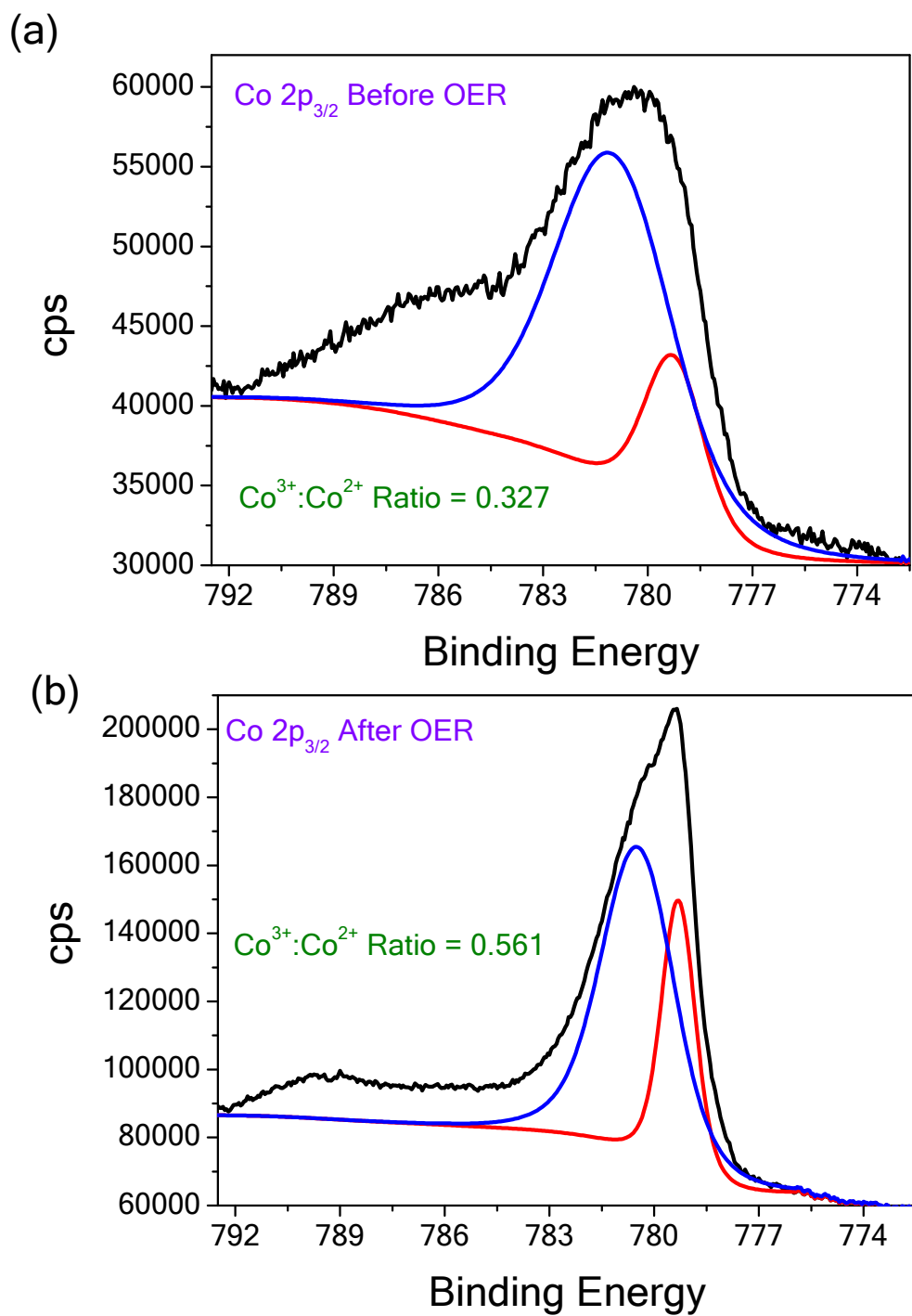


Fig. S4: (a-b) High resolution XPS spectra of Co 2p_{3/2} state of Co₂TiO₄ before and after OER studies.