Solution plasma synthesis of perovskite hydroxide CoSn(OH)$_6$ nanocube electrocatalysts toward oxygen evolution reaction

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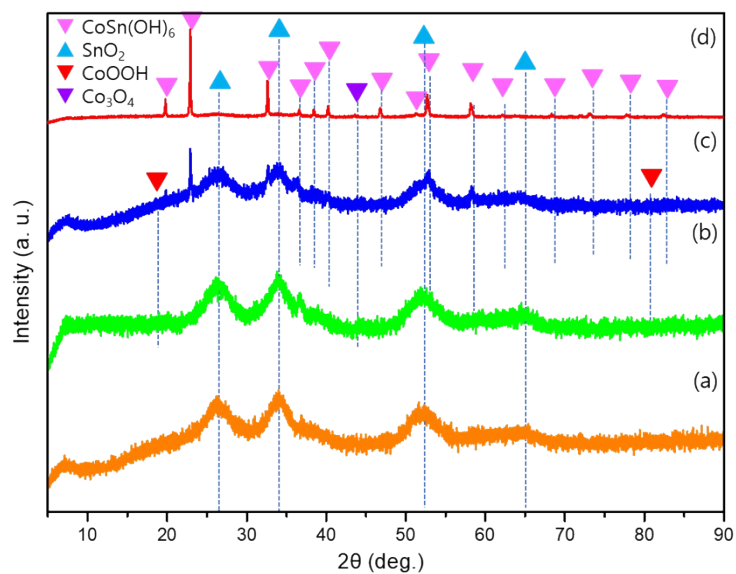*Corresponding author: ishizaki@shibaura-it.ac.jp

Figure S1. XRD patterns of samples synthesized by co-precipitation method from aqueous solutions at different pH: (a) CSO_ pH8p, (b) CSO_ pH 9p, (c) CSO_ pH10p, and (d) CSO_ pH12p.
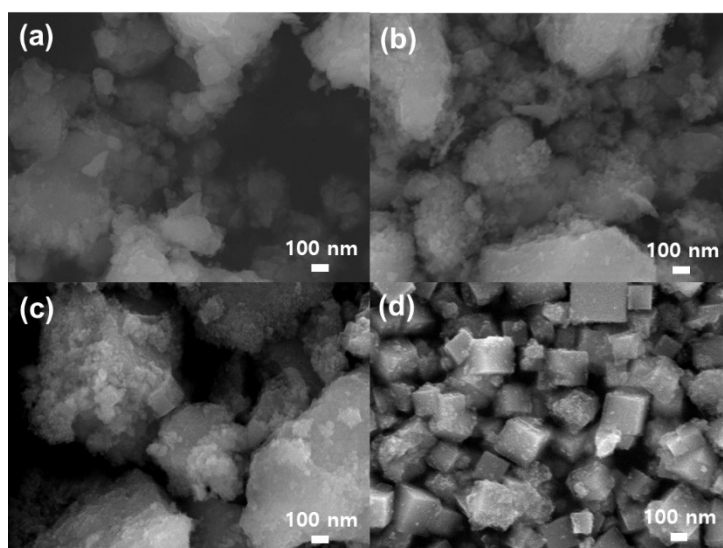

Figure S2. FE-SEM images of samples synthesized by co-precipitation method from aqueous solutions at different pH: (a) CSO_ pH8p, (b) CSO_pH 9p, (c) CSO_ pH10p, and (d) CSO_ pH12p.
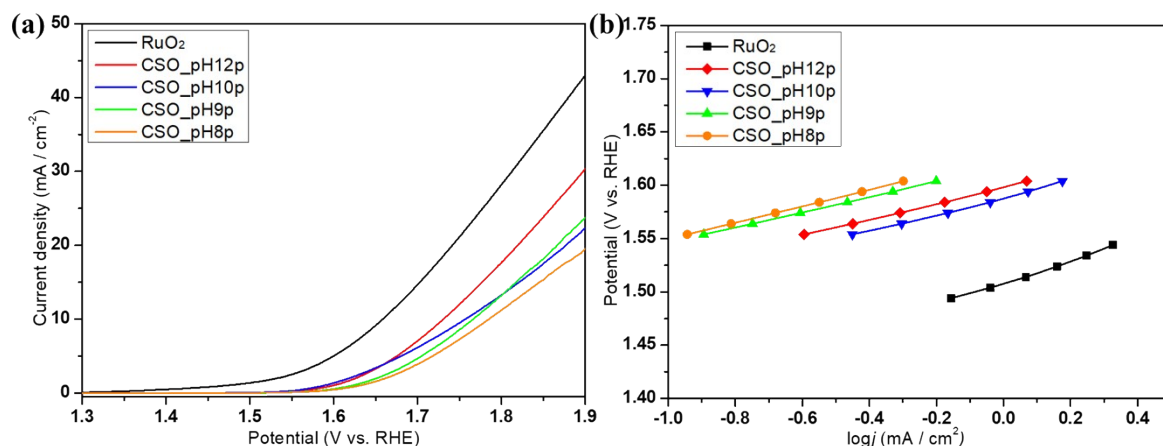
Figure S3. (a) Linear sweep voltammograms of the samples synthesized by co-precipitation method at different pH and commercial RuO_2, and (b) Tafel slopes of the samples synthesized by co-precipitation method at different pH and commercial RuO_2.

Table S1 OER onset potentials, potentials at reaching 10 mA/cm^2, overpotentials at 10 mA/cm^2, and Tafel slope values of the samples synthesized by co-precipitation method at different pH, and commercial RuO_2.

Sample	OER Onset Potentials [V vs RHE]	Potentials at reaching 10 mA/cm^2 [V vs RHE]	Tafel Slopes [mV/dec.]
CSO_pH12p	1.550	1.731	75.08
CSO_pH10p	1.545	1.757	78.23
CSO_pH9p	1.565	1.767	79.40
CSO_pH8p	1.570	1.785	82.35
RuO_2	1.475	1.659	73.34

Calculation method of electrochemically active surface areas (ECSA)

The ECSA of a material with similar composition is proportional to its electrochemical double-layer capacitance (C_{dl}), which was measured by CV in a non-Faradaic region at different scan rates (V_b) of 20, 50, 100, 200, 400, 600, 800, and 1000 mV s^{-1} (Figure 9c and d). Then, the double-layer capacitance (C_{dl}) was estimated by plotting the $\Delta j = (j_a - j_c)$ at 1.273 V vs RHE as a function of the scan rate (Figure 9f). It can be calculated using the equation:
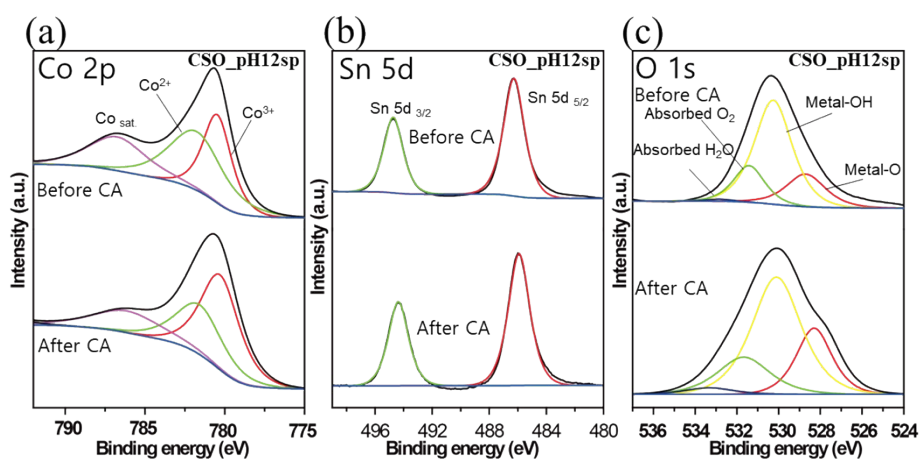
$$C_{dl} = (\Delta j) / 2dV_b$$

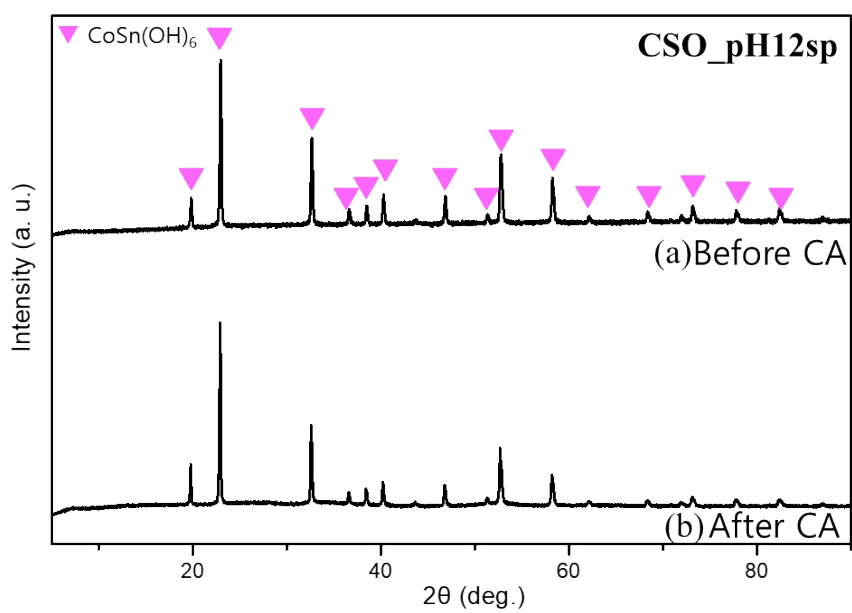Figure S4. XPS (a) Co 2*p*, (b) Sn 3*d*, and (c) O 1*s* spectra of CSO_pH12sp before and after CA test.

Figure S5. XRD patterns of CSO_pH12sp (a) before and (b) after the CA test.