Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary information

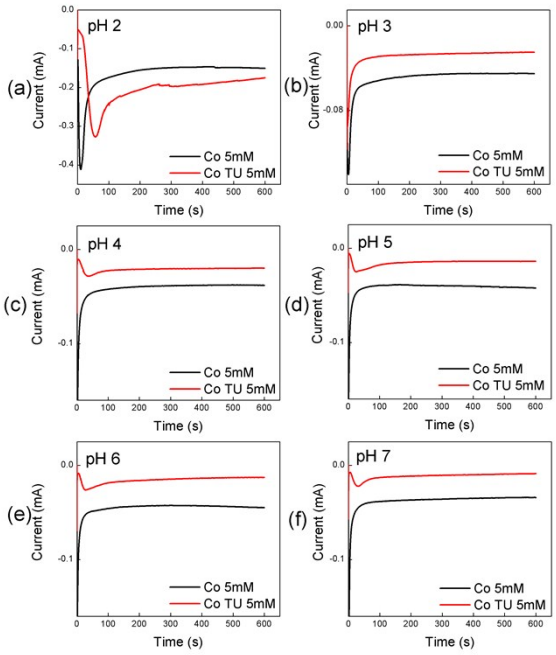

Figure S1: Current-time transients recorded at a GC electrode in an electrolyte containing 0.005M of Co (II) and 0.005M of Co (II) + 0.005M of Thiourea at -1.1 V vs Ag|AgCl at different pH values.

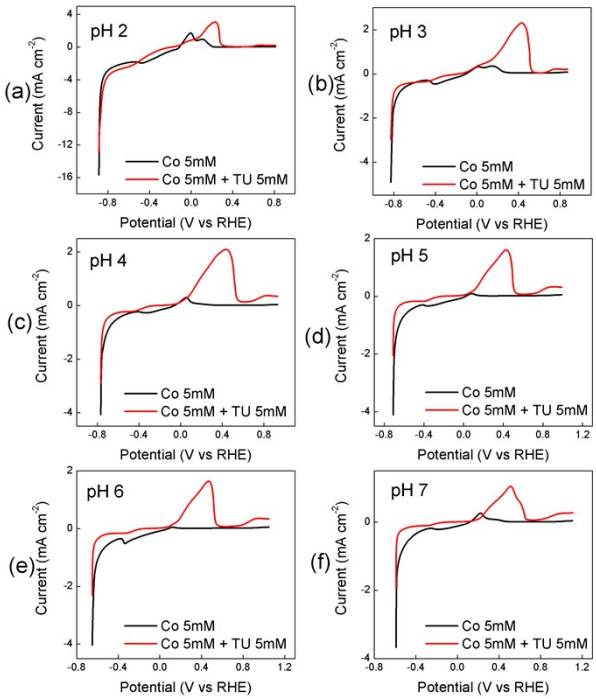

Figure S2: Anodic stripping voltammograms after potentiostatic deposition at -1.1 V vs Ag|AgCl for 10 minutes in solutions containing 0.005M of Co (II) and 0.005M of Co (II) + 0.005 M of Thiourea at different pH values.

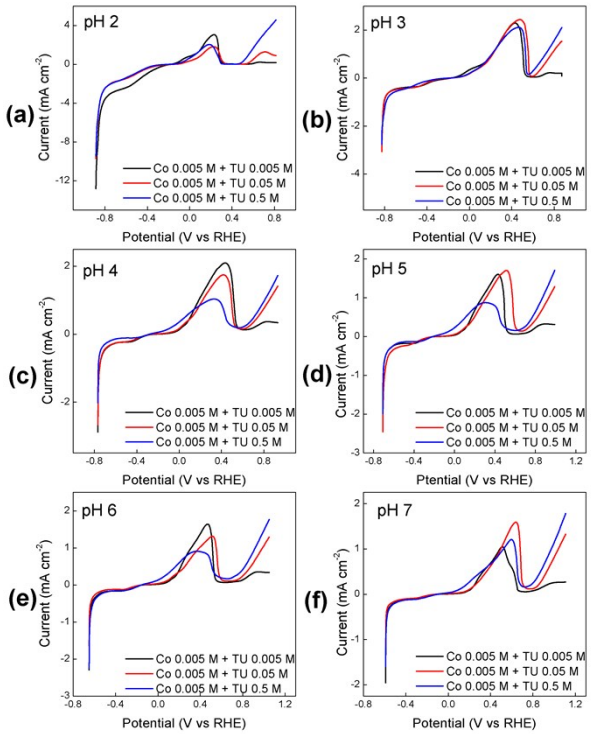

Figure S3: Anodic stripping voltammograms after potentiostatic deposition at -1.1 V vs Ag|AgCl for 10 minutes in the solutions containing 0.005 M of Co(II) and 0.005 M of TU, 0.05 M of TU and 0.5 M of TU at different pH values.

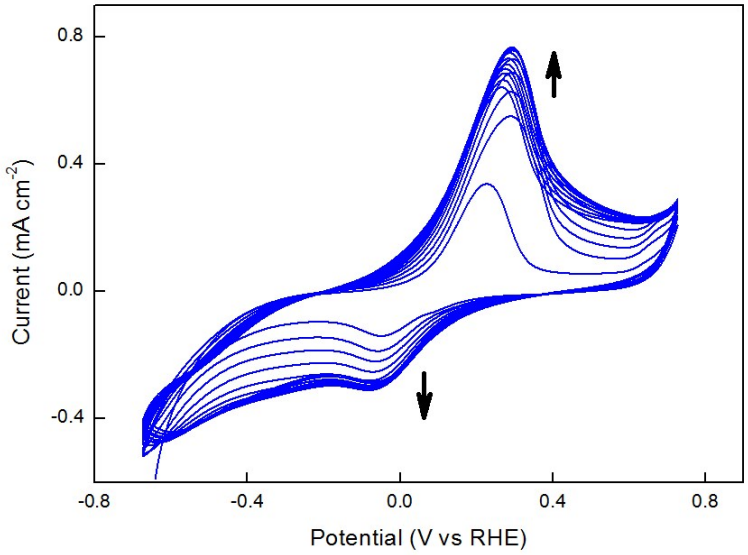

Figure S4: Cyclic voltammetry recorded at a glassy carbon electrode performed from -0.67 to 0.72 vs RHE at a scan rate of 15 mV s^{-1} in a solution containing 0.005 M Co(II) and 0.005 M TU.

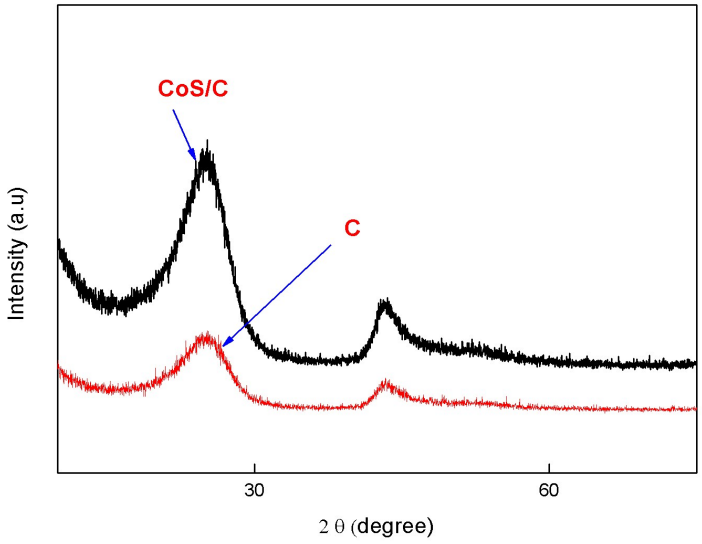

Figure S5: XRD of CoS_x film electrodeposited on a glassy carbon substrate fabricated by cyclic voltammetry at a scan rate of 15 mV s^{-1} for 15 cycles in a solution containing 0.005 M of Co (II) and 0.5 M of thiourea and the blank carbon substrate.

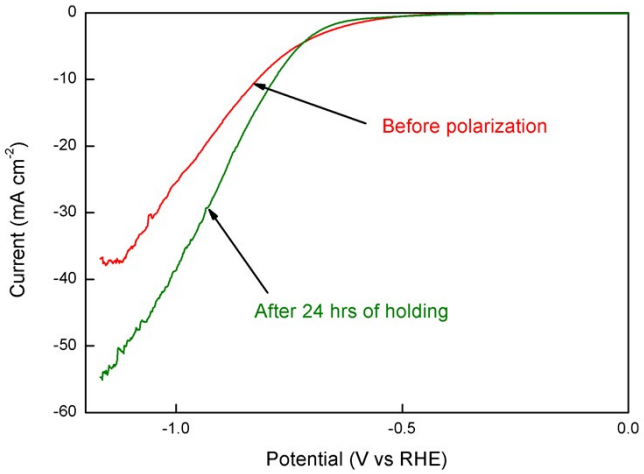

Figure S6: Linear sweep voltammograms recorded at a GC electrode modified with CoS_x films in phosphate buffer solution (pH 7.4) at a sweep rate of 5 mV s^{-1} before and after 24 h of HER at an applied current density of -10 mA cm^{-2}.

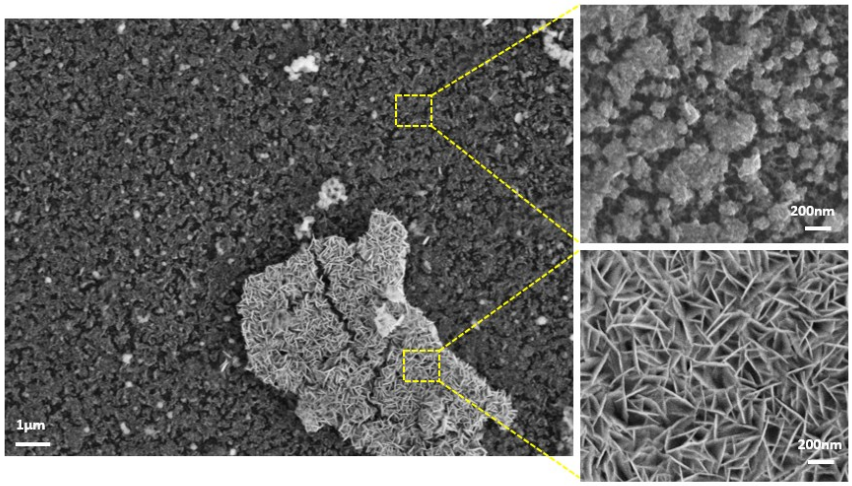

Figure S7: SEM images of a CoS_x film deposited on a glassy carbon electrode via cyclic voltammetry at a scan rate of 15 mV s^{-1} for 15 cycles in a solution containing 0.005 M of Co (II) and (a) 0.005 M of thiourea after the OER in 1.0 M NaOH.

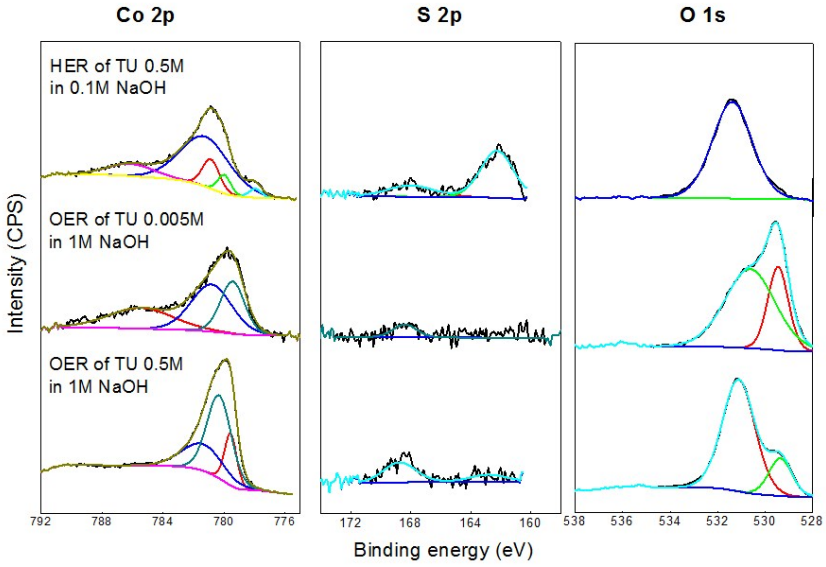

Figure S8: Co 2p, S 2p and O 1S XPS spectra of CoS_x deposited films obtained through cyclic voltammetry at a scan rate of 15 mV s^{-1} for 15 cycles in solutions of 0.005 M Co(II) containing either 0.005 M TU or 0.5 TU after HER and OER experiments.

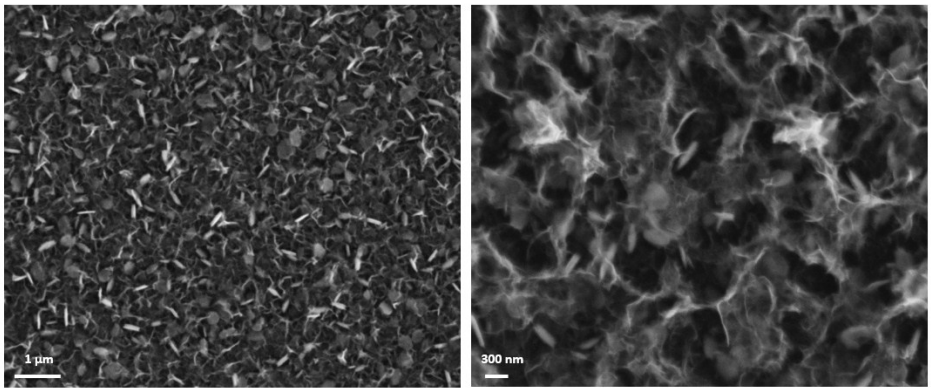

Figure S9: SEM images of CoS_x deposited film obtained through cyclic voltammetry at a scan rate of 15 mV s^{-1} for 15 cycles in a solutions of 0.005 M Co(II) containing 0.5 TU after the HER in 1.0 M NaOH.