Supporting Information

Copper cobalt tin sulphide (Cu_2CoSnS_4) anodes synthesised using a chemical route for stable and efficient rechargeable lithium-ion batteries

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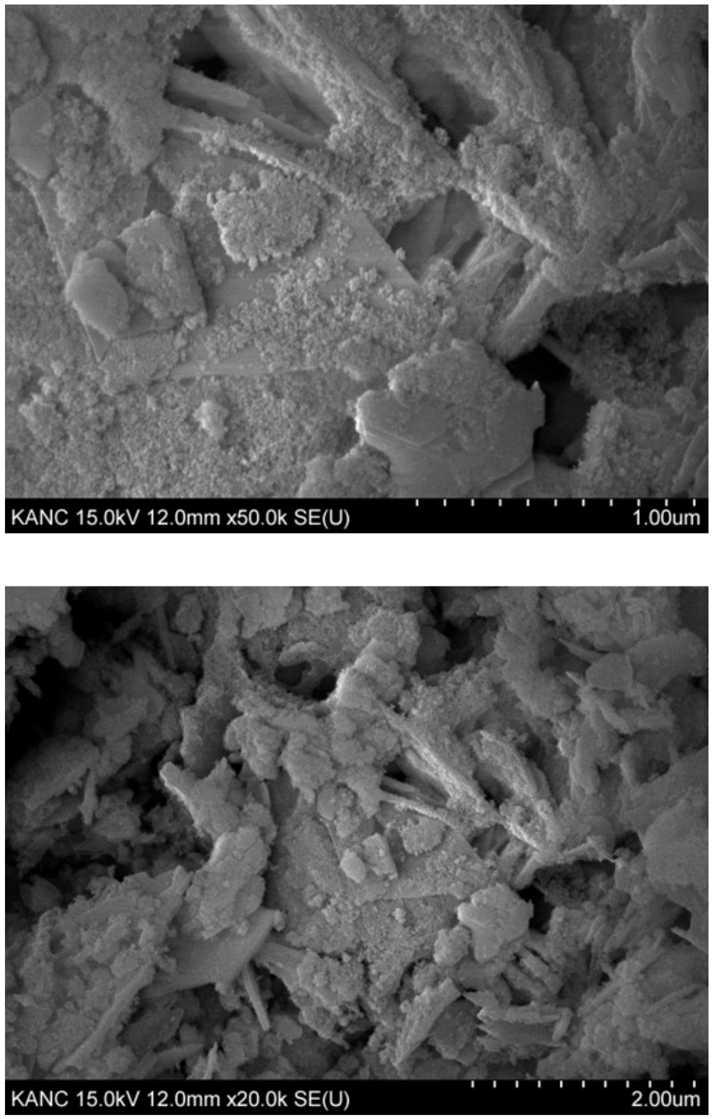

Figure S1. Scanning electron microscope (SEM) images of the CCTS powder sample exhibit large-sized CCTS sheets and overgrown nanograins.

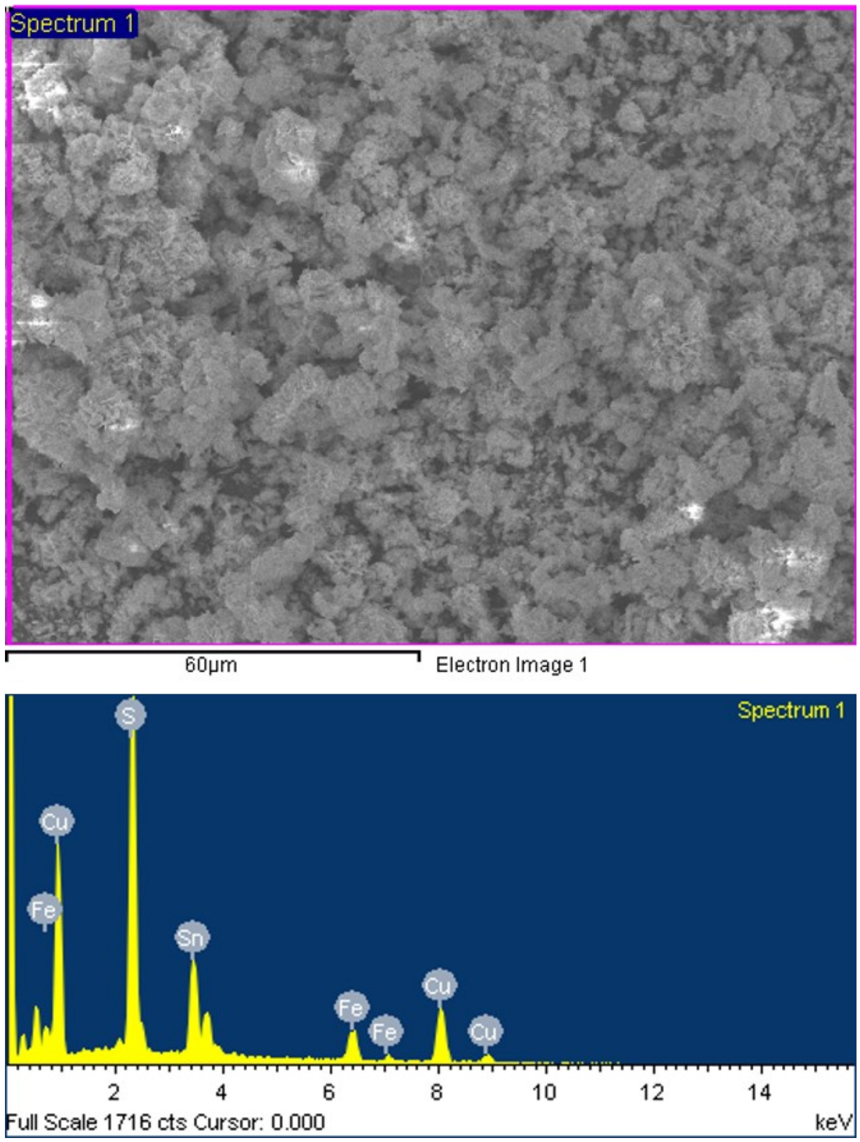

Figure S2. Low magnified SEM image of the CCTS powder electrode and the point where EDS spectrum recorded.

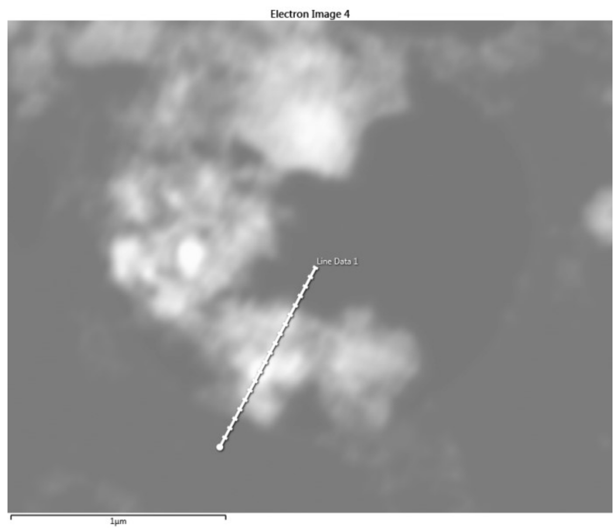

Figure S3. High-angle annular dark-field-scanning transmission electron microscopy (HAADF-STEM) image where the STEM elemental line scan profile was recorded (Figure 2(g) in the main text).

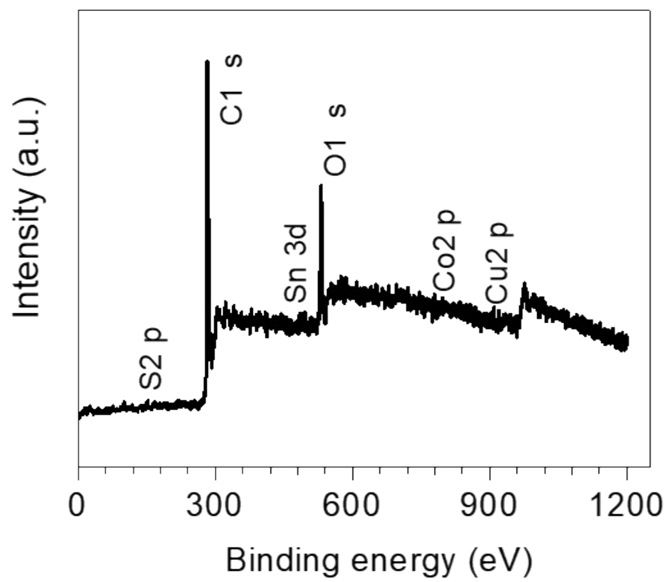

Figure S4. X-ray photoelectron spectroscopy (XPS) survey spectrum of the CCTS powder electrode revealing the presence of the main elements Cu, Co, Sn and S.

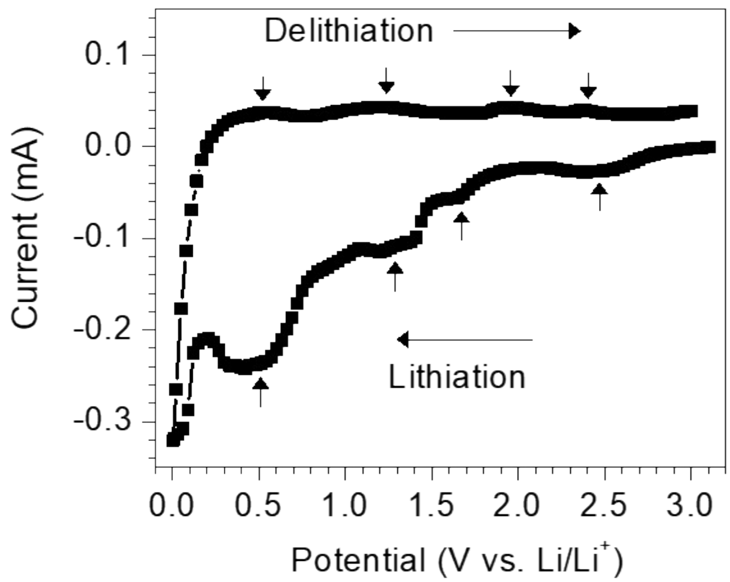

Figure S5. The first CV curve of the CCTS anode electrode recorded in the potential window between 0.01 and 3.0 V (vs. Li/Li^{+}) at a scan rate of 0.1 mVs^{-1}. The multiple cathodic and anodic peaks marked with arrows are associated with the phase transition and structural rearrangement during the initial surge of the Li^{2+} ions.

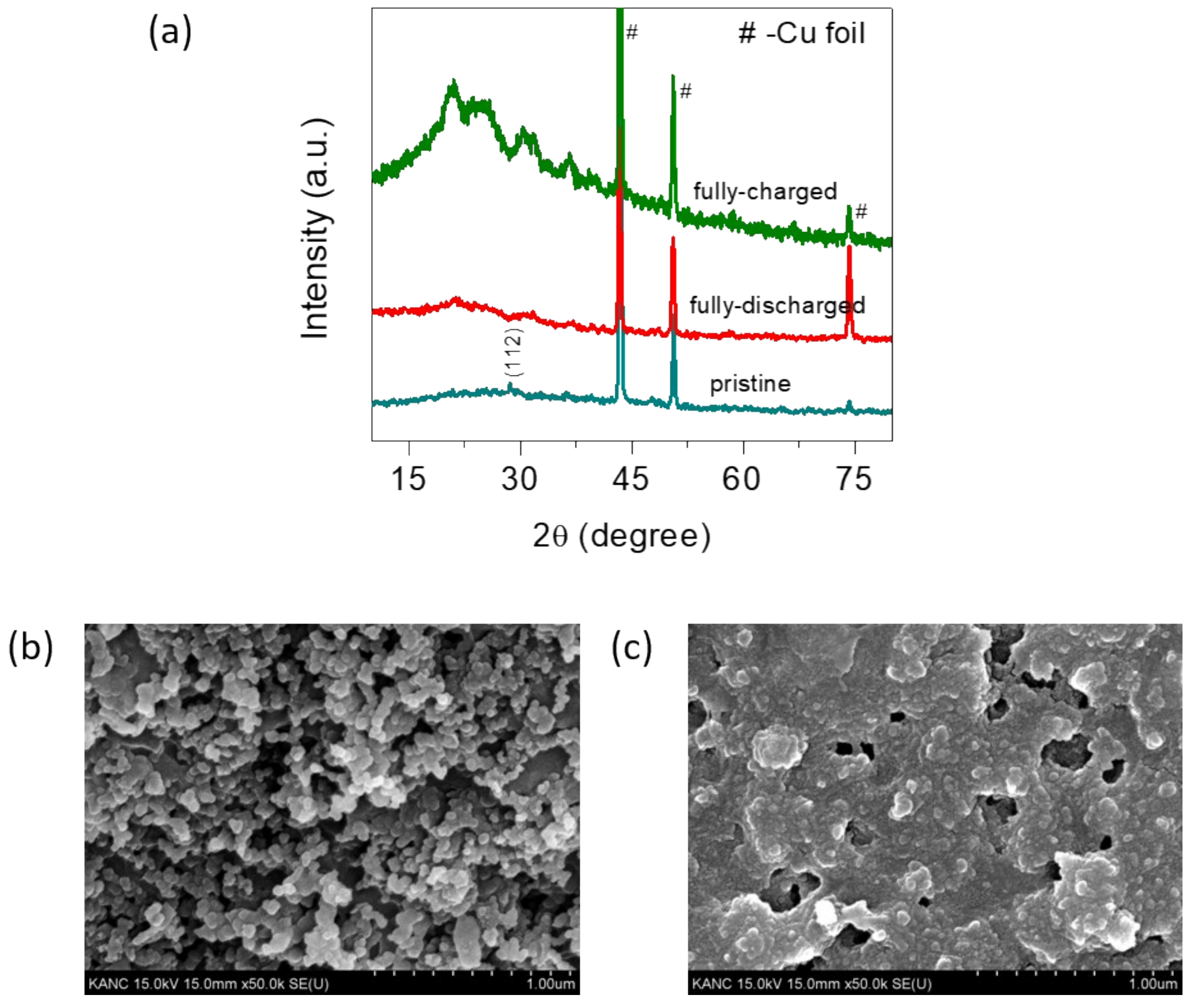

Figure S6. (a) Ex-situ X-ray diffraction spectra of CCTS in the fully charged to 3.0 V and fully discharged to 0.01 V states. Ex-situ SEM morphologies of the CCTS anode electrode (b) as grown CCTS electrode onto Cu-foil paper, (c) after Li-ion battery test.

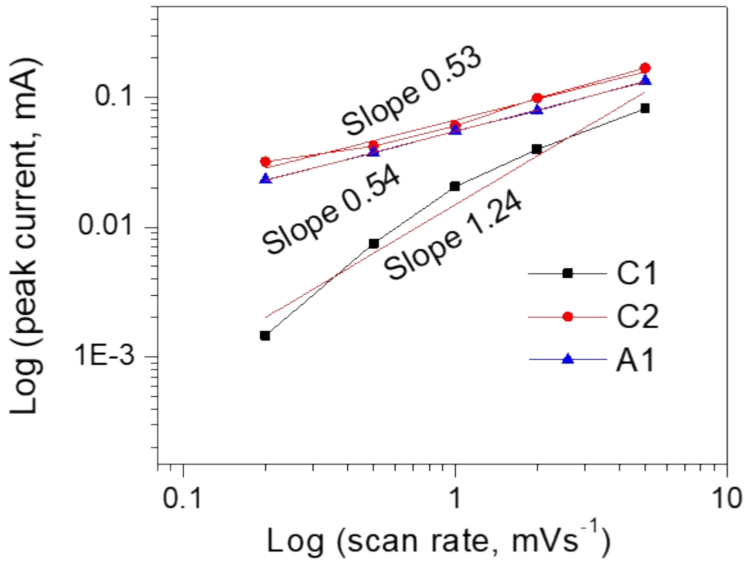

Figure S7. The slope of log (i) vs log (ν) curves giving information on the mechanism exhibited by into the electrode. If the slope is less than 0.5 it is diffusion controlled and if the slope is more than 1 it is controlled by the capacitive-type storage mechanism.

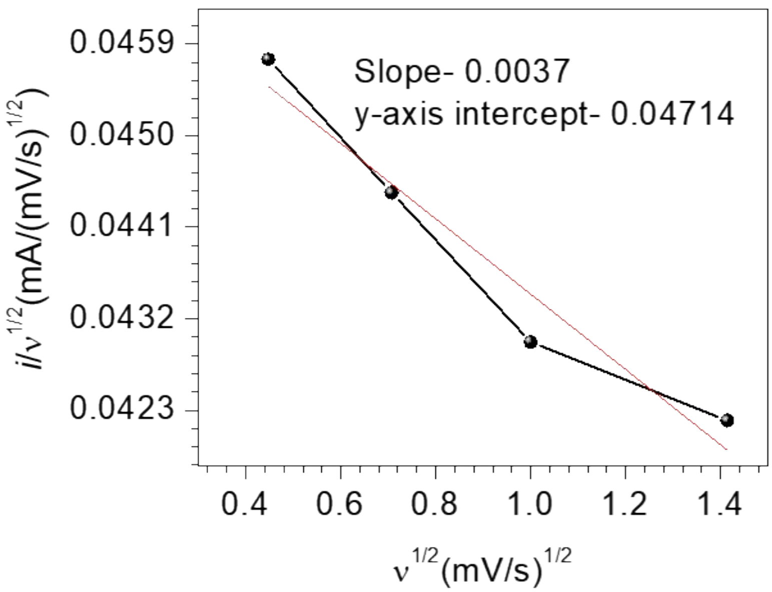

Figure S8. The capacitive contribution and diffusion-controlled contribution are calculated using by plotting $v^{1/2}$ versus $i/ v^{1/2}$.

Table S1- Parameters obtained by fitting of Nyquist plot using Zfit software as a function of potential.

Sr. No.	**Potential (V)**	**Solution resistance *Rs* (Ω)**	**Charge-transfer resistance *Rct* (Ω)**	**Warburg impedance *W* ($\Omega.s^{-1/2}$)**
1.	0.0	8.7	107	114.5
2.	1.0	9.2	117.5	218
3.	2.0	9	136	650