

Electronic Supplementary Material (ESI) for RSC Advances.

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Figure S1

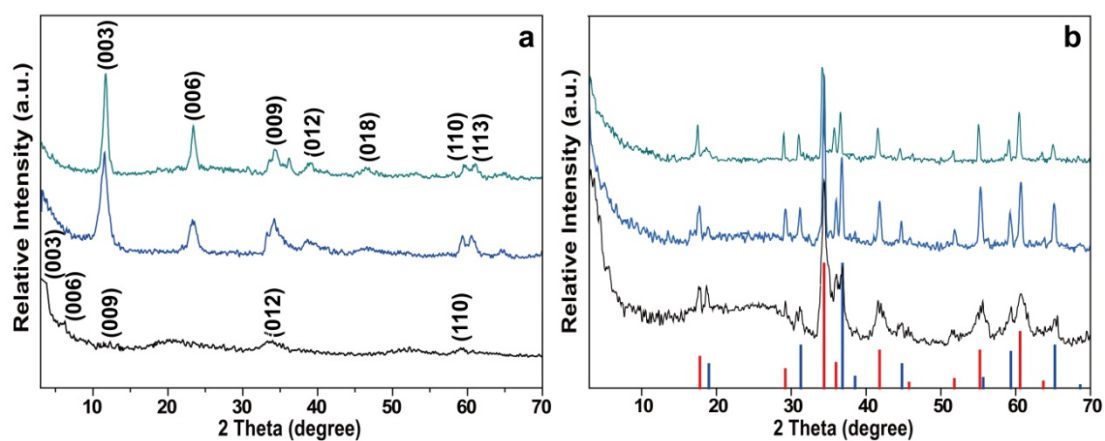


Fig. S1 (a) CoSn-LDH (green line), CoAlSn-LDH (blue line) and LA⁻ intercalated CoSn-LDH precursor (black line). (b) Co₂SnO₄/Co₃O₄ (green line), Co₂SnO₄/Co₃O₄/Al₂O₃ (blue line), Co₂SnO₄/Co₃O₄/C (black line) composites.

Figure S2

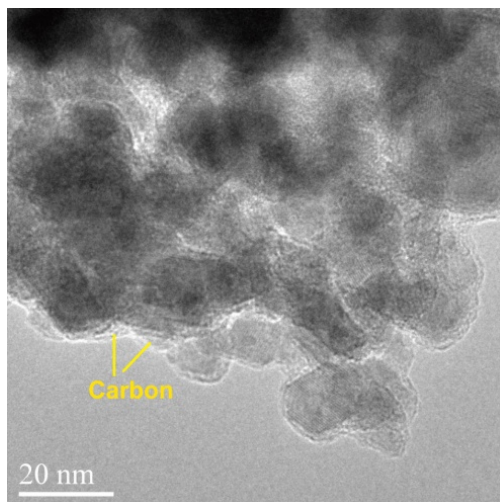


Fig. S2 HRTEM image of $\text{Co}_2\text{SnO}_4/\text{Co}_3\text{O}_4/\text{Al}_2\text{O}_3/\text{C}$ composite.

Figure S3

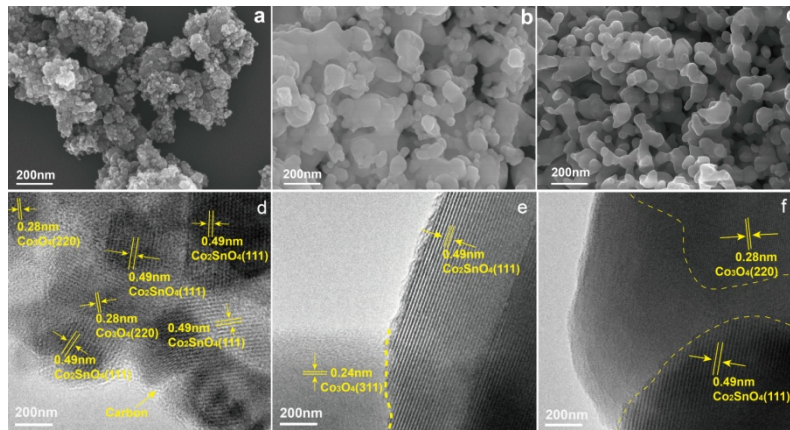


Fig. S3 (a-c) SEM and (c-f) HRTEM images of different composites: (a, d) Co₂SnO₄/Co₃O₄/C, (b, e) Co₂SnO₄/Co₃O₄, and (c, f) Co₂SnO₄/Co₃O₄/Al₂O₃.

Figure S4

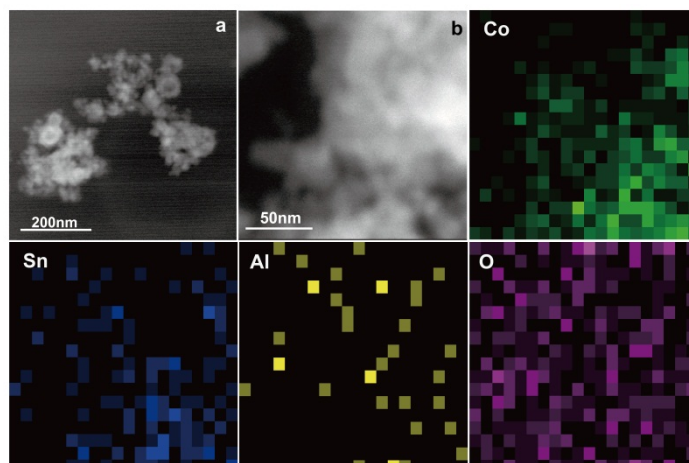


Fig. S4 (a, b) HAADF-STEM images of $\text{Co}_2\text{SnO}_4/\text{Co}_3\text{O}_4/\text{Al}_2\text{O}_3/\text{C}$ composite, and corresponding EDX mapping of elements Co, Sn, Al, and O.

Figure S5

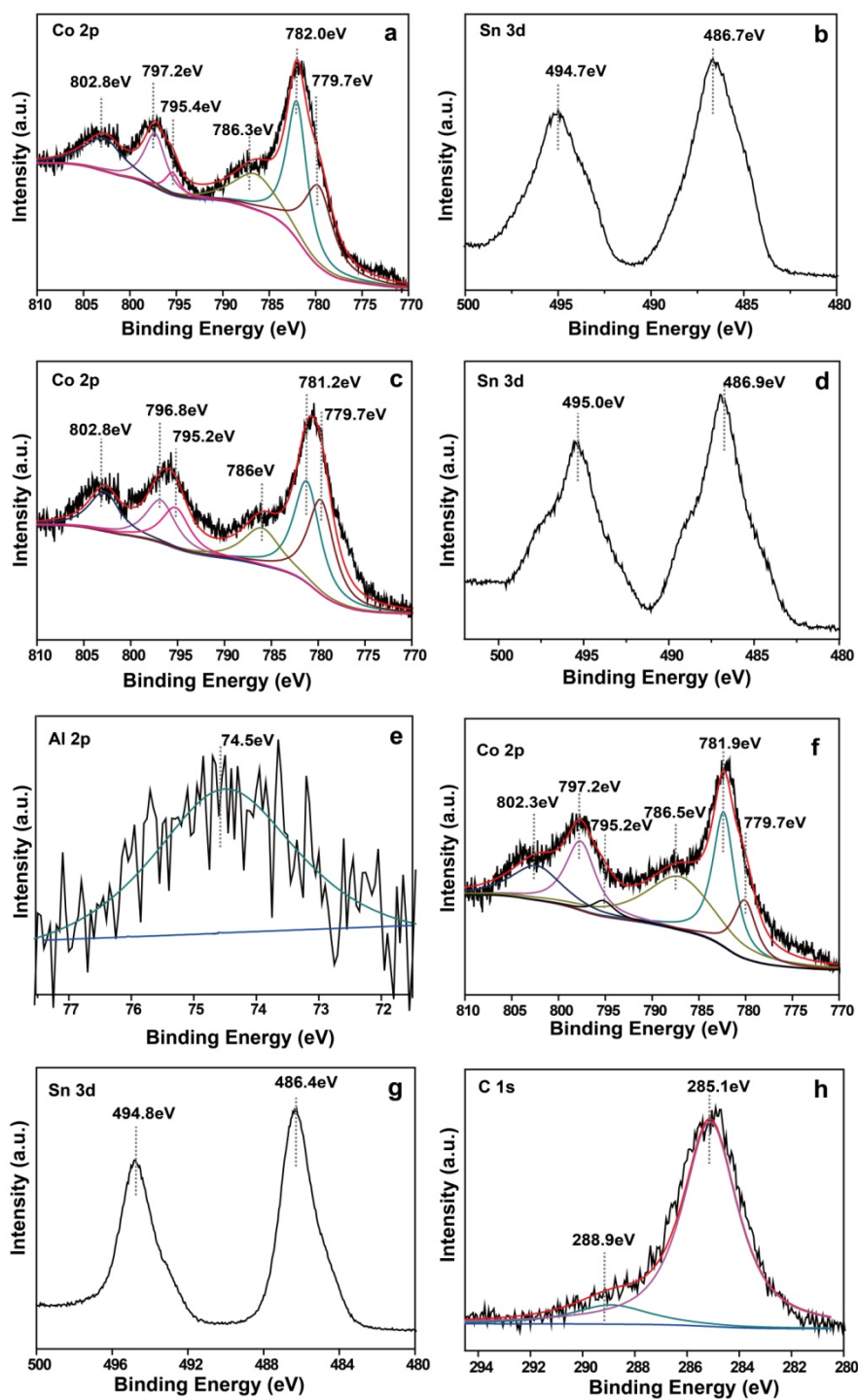


Fig. S5 XPS spectra of $\text{Co}_2\text{SnO}_4/\text{Co}_3\text{O}_4$ for (a) Co 2p, (b) Sn 3d, $\text{Co}_2\text{SnO}_4/\text{Co}_3\text{O}_4/\text{Al}_2\text{O}_3$ for (c) Co 2p, (d) Sn 3d, (e) Al 2p, $\text{Co}_2\text{SnO}_4/\text{Co}_3\text{O}_4/\text{C}$ for (f) Co 2p, (g) Sn 3d, (h) C 1s.

Figure S6

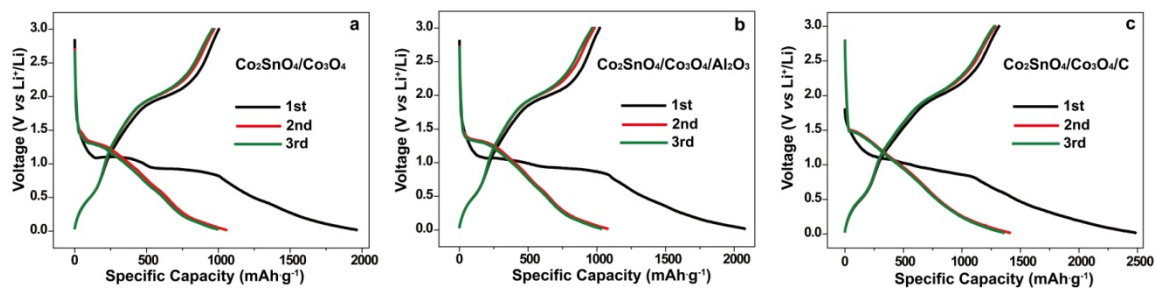


Fig. S6 The first three charge-discharge profiles of different composite electrodes at 100 mA g⁻¹: (a) $\text{Co}_2\text{SnO}_4/\text{Co}_3\text{O}_4$, (b) $\text{Co}_2\text{SnO}_4/\text{Co}_3\text{O}_4/\text{Al}_2\text{O}_3$, and (c) $\text{Co}_2\text{SnO}_4/\text{Co}_3\text{O}_4/\text{C}$.

Figure S7

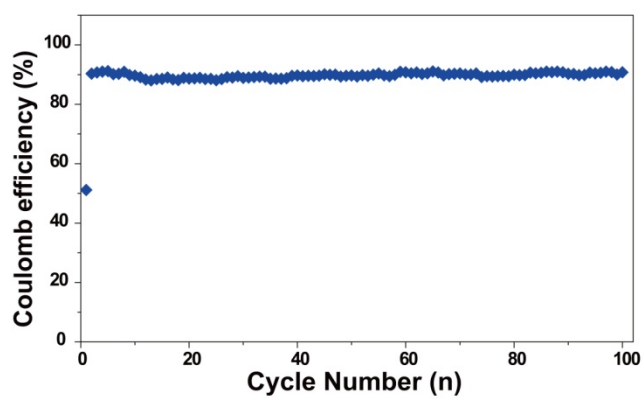


Fig. S7 The plot of Coulombic efficiency vs. cycle number for the $\text{Co}_2\text{SnO}_4/\text{Co}_3\text{O}_4/\text{Al}_2\text{O}_3/\text{C}$ electrode.

Table S1

Table S1 Comparison of reversible specific capacity between the electrodes of Co₂SnO₄/Co₃O₄/Al₂O₃/C and the Co₂SnO₄- or Co₃O₄- based composites reported.

Hybrid Nanomaterials	Active material (wt. %)	Current Density (mA g ⁻¹)	Cycle Number	Specific Capacity (mA h g ⁻¹)	Reference
Co ₂ SnO ₄ nanocrystal	60	30	50	556	[43]
Co ₂ SnO ₄ /graphene	60	100	100	1000	[7]
Co ₂ SnO ₄ /MWCNTs	80	50	50	899	[42]
Co ₂ SnO ₄ /Co ₃ O ₄	60	100	50	703	[24]
Co ₃ O ₄ microsphere	50	50	30	1615	[47]
Co ₃ O ₄ /C	80	100	50	1079	[48]
Co ₃ O ₄ /α-Fe ₂ O ₃	100	100	60	980	[49]
SnO ₂ @Co ₃ O ₄	70	100	100	962	[50]
Co ₂ SnO ₄ /Co ₃ O ₄ /Al ₂ O ₃ /C	70	100	100	1170	this study