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Supporting Information for

Facile and cost effective synthesis of mesoporous spinel $NiCo_2O_4$ as an anode for high lithium storage capacity

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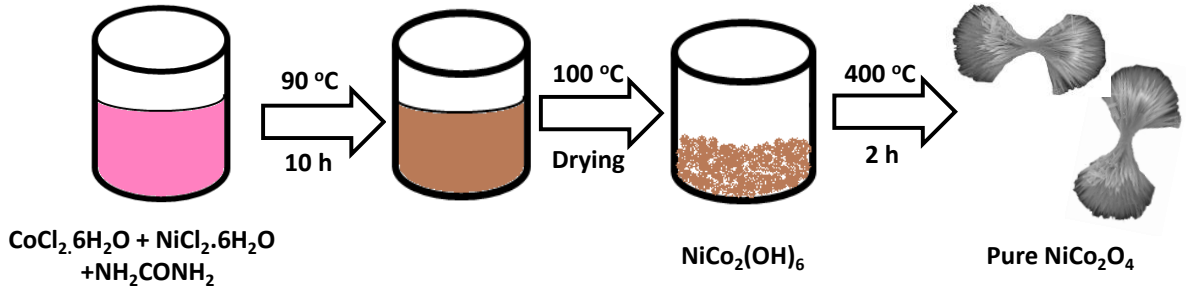
Schematic representation of experimental procedure



Scheme 1.Schematic illustration of synthesis of urchin-like $NiCo_2O_4$.

Energy dispersive X-ray spectroscopy analysis

Energy dispersive X-ray spectroscopy (EDS) attached to FE-SEM was used to investigate the composition of Co, Ni and O present in spinel $NiCo_2O_4$ annealed at 673 K for 2h, and the results are shown in Fig. S1. The EDS analysis reveals that the Co/Ni ratio is close to the designed ratio of 1:2 (Ni: Co).

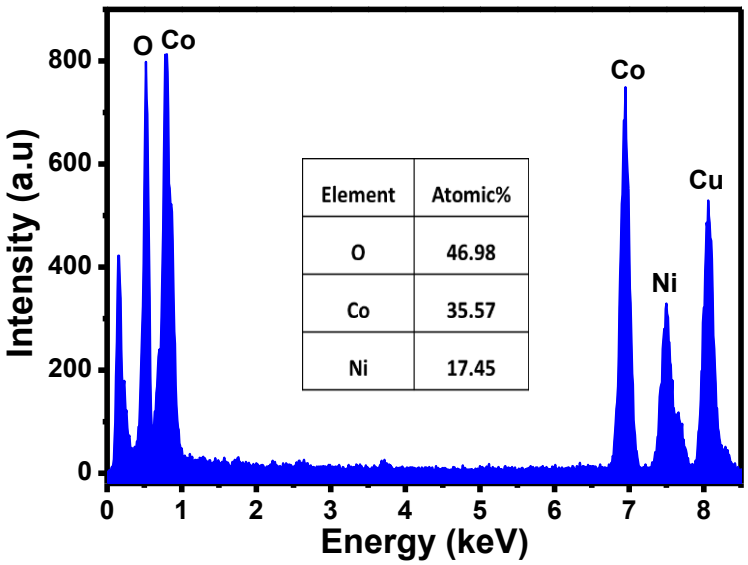


Fig. S1. EDS spectrum and analyzed atomic % of Co, Ni and O (inset) for the spinel $NiCo_2O_4$ annealed at 673 K for 2 h.

EDS elemental mapping

EDS elemental mapping was carried out to analyze the distribution of each element in spinel $NiCo_2O_4$. Fig. S2a and Fig. S2b-S2d shows the FE-SEM image and the corresponding EDS mapping for Co, Ni, and O elements, respectively. The spots correspond to the presence of the corresponding element. EDS mapping confirms the extremely well dispersed metal ions in the $NiCo_2O_4$.

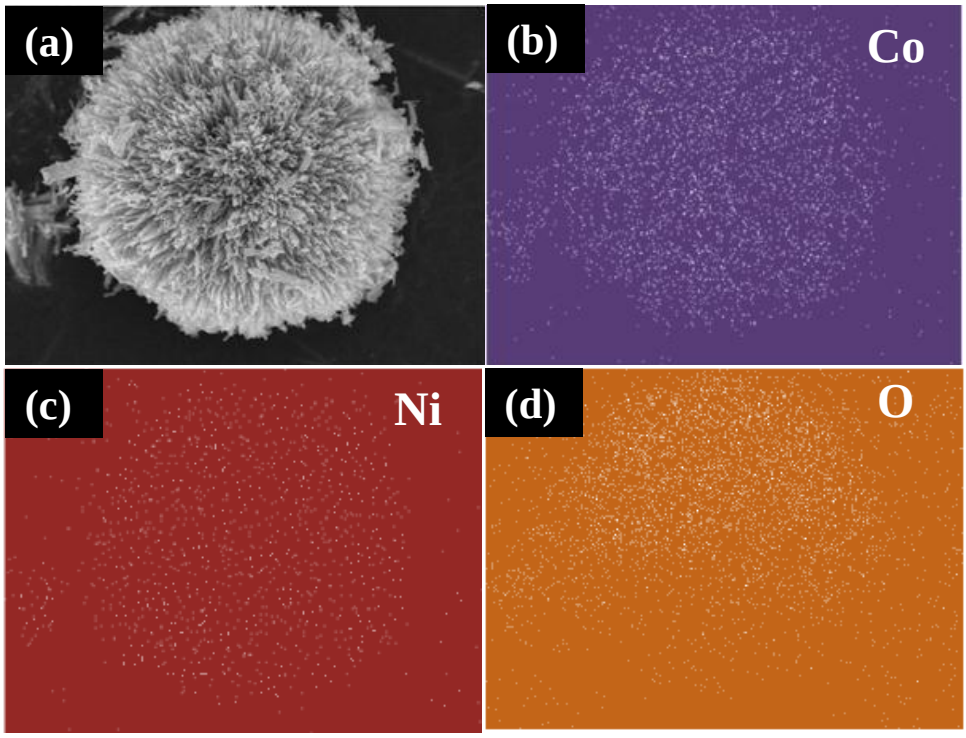


Fig. S2 (a) FE-SEM image and corresponding EDS elemental mapping for (b) Co, (c) Ni, and (d) O.

Electrochemical characterization

Fig. S3 shows the cycling performance of the $NiCo_2O_4$ electrode measured at 0.1 C for 150 cycles. High initial discharge capacity of 1313 mA h g^{-1} followed by fast decay; 965 mA h g^{-1} discharge capacity retained at the second cycle. The spinel $NiCo_2O_4$ electrode showed the average discharge capacity of ~850 mA h g^{-1} up to 20 cycles. A gradual increase in capacity was observed after 20 cycles and the discharge capacity and charge capacity of ~1050 and 1020 mA h g^{-1}, respectively, were retained even after 150 cycles.

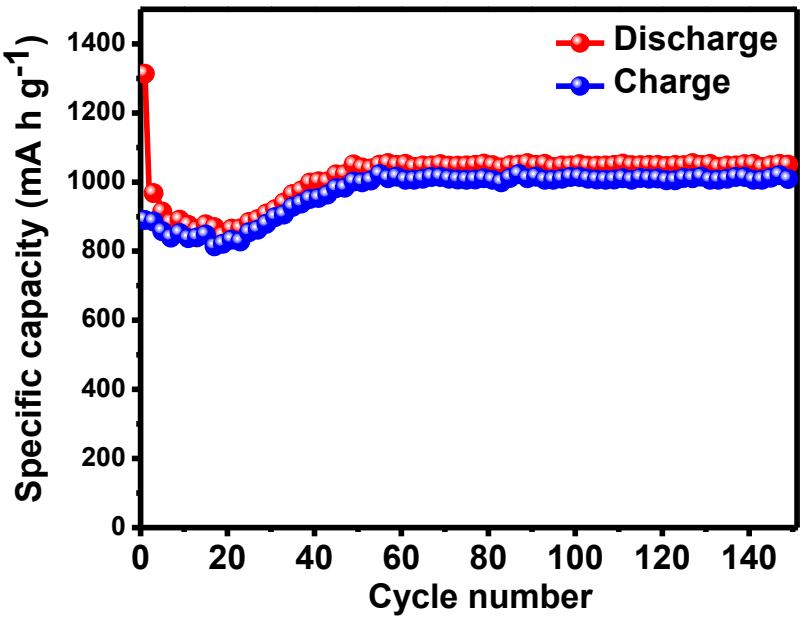


Fig. S3 Cyclability of the $NiCo_2O_4$ electrode discharged and charged at 0.1 C.

Analysis of electrode after charge-discharge cycling

The electrode cycled for 400 cycles was opened in an argon filled glove box and characterized by XRD and FE – SEM in order to investigate the structural changes of the electrode active material upon cycling. The electrolyte was soaked in dimethyl carbonate overnight to remove the SEI layer and dried for 48h.

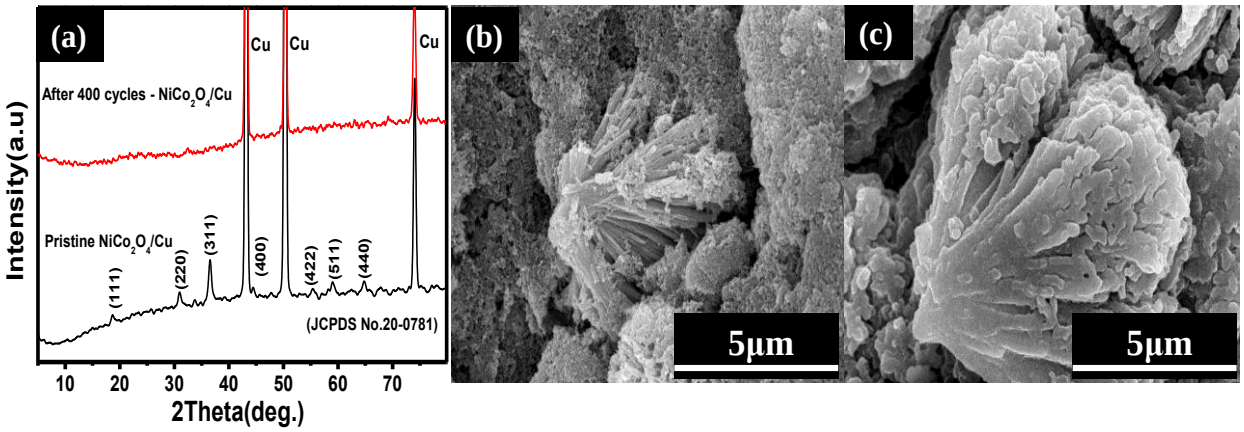


Fig. S4 (a) XRD patterns and FE-SEM images (b) before and after (c) 400 cycles of $NiCo_2O_4$/Cu electrode at 0.5 C rate.