Morphology reconstruction of Nikel Cobalt layered double hydroxides induced by electrolyte concentrations triggers high performance of supercapacitive storage

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Abstract

Nikel Cobalt layered double hydroxides (NiCo LDHs) have emerged as ideal electrode materials for supercapacitor due to their high specific surface area and excellent cycling stability. Morphology control plays a unique role in regulating the performance of NiCo LDHs, but there are rare reports to regulate the morphology during energy storage. Herein, the morphology of NiCo-LDHs electrode is optimized for enhancing energy storage by simple activation process with different t concentrations of the electrolyte. During the activation process, electrochemical morphology reconstructed occurs on the electrode surface. With2 M KOH electrolyte the NiCo-LDH electrode transforms from nanosheets to nanoflower, which aids in reducing the distance of ion transport. The reconstructed NiCo-LDH (NiCo-LDH-2) exhibits an ultra-high specific capacitance of 5428 F g-1 at a current density of 1 A g-1, outperforming most of NiCo LDHs. Even at a high current density of 10 A g-1, the capacitance retention rate remains above 77.6% after 1000 charge-discharge cycles. The strategy proposed in the study, which involves concentration-controlled morphology optimization for energy storage enhancement, holds great practical significance for the field of supercapacitors.

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