

# Nickel Cobalt Hydroxides With Tunable Thin-layer Nanosheets for High-performance Supercapacitor Electrode

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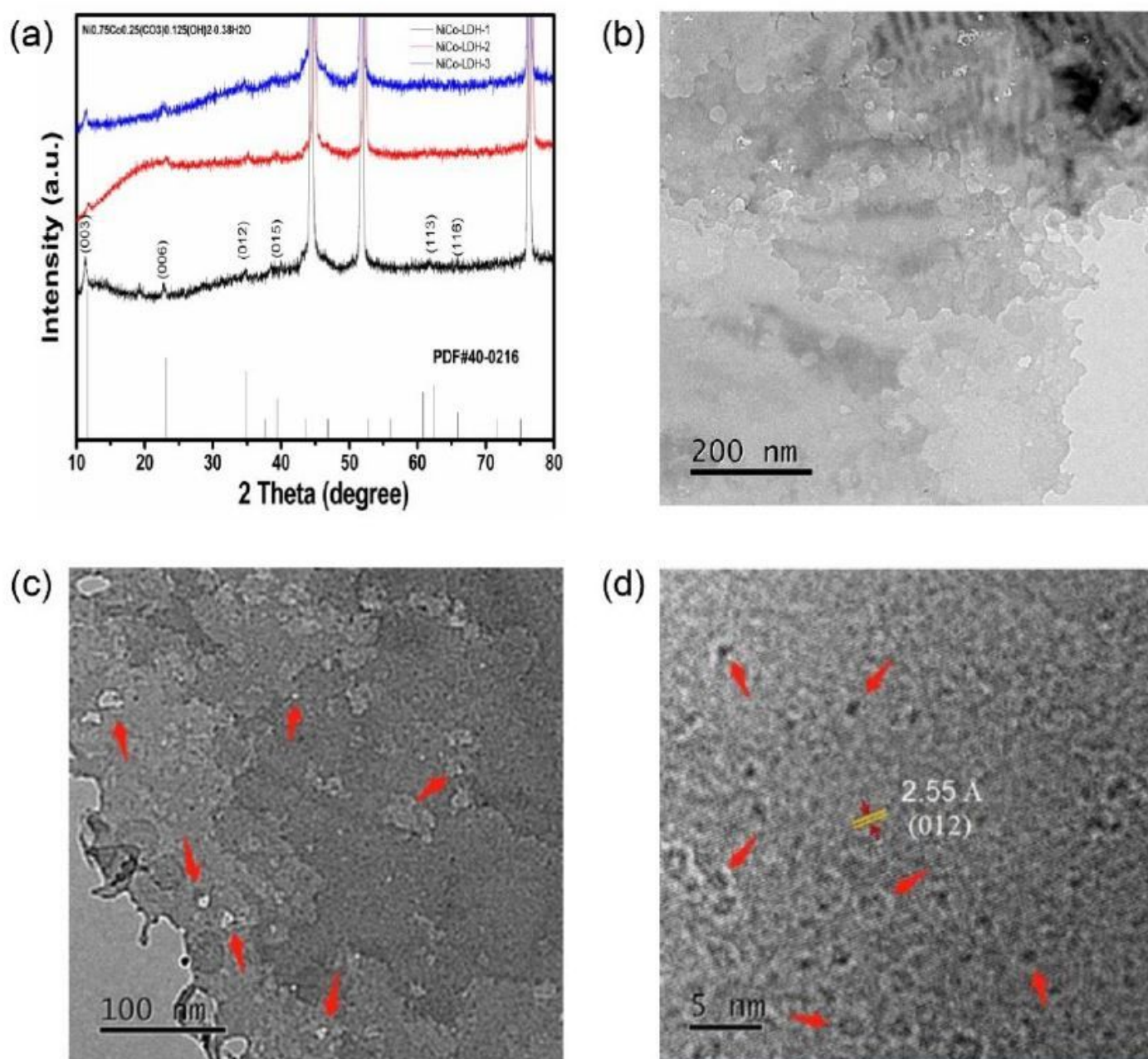
## Abstract

Layered double hydroxides as typical supercapacitor electrode materials can perform superior energy storage if the structures are well regulated. In this work, a simple one-step hydrothermal method is used to prepare diverse nickel cobalt layered double hydroxides (NiCo-LDHs), in which the different contents of urea are used to synthesize the different nanostructures of NiCo-LDHs. The results show that the decrease in urea content can effectively improve the dispersibility of NiCo-LDHs, adjust the thickness of materials and optimize the internal pore structures, thereby enhancing the capacitance performance of NiCo-LDHs. When the content of urea is reduced from 0.03 g to 0.0075 g under a fixed precursor materials mass ratio of nickel (0.06 g) to cobalt (0.02 g) of 3:1, the prepared sample NiCo-LDH-1 exhibits the thickness of 1.62 nm, and the clear thin-layer nanosheets structures and a large number of surface pores are formed, which is beneficial to the transmission of ions into the electrode material. After being prepared as a supercapacitor electrode, the NiCo-LDH-1 displays an ultra-high specific capacitance of 3982.5 F g<sup>-1</sup> under the current density of 1 A g<sup>-1</sup>, and high capacitance retention above 93.6% after 1000 cycles of charging and discharging at a high current density of 10 A g<sup>-1</sup>. The excellent electrochemical performance of NiCo-LDH-1 is proved by assembling two-electrode asymmetric supercapacitor with carbon spheres, displaying the specific capacitance of 95 F g<sup>-1</sup> at 1 A g<sup>-1</sup> and the capacitance retention with 78% over 1000 cycles. As a result, it offers a facile way to control the nanostructure of NiCo-LDHs, confirms the important affection of urea on enhancing capacitive performance for supercapacitor electrode and provides the high possibility for the development of high-performance supercapacitors.

## Full-text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

## Figures



**Figure 2**

a) X-ray diffraction patterns of the samples; (b)-(d) TEM images of NiCo-LDH-1

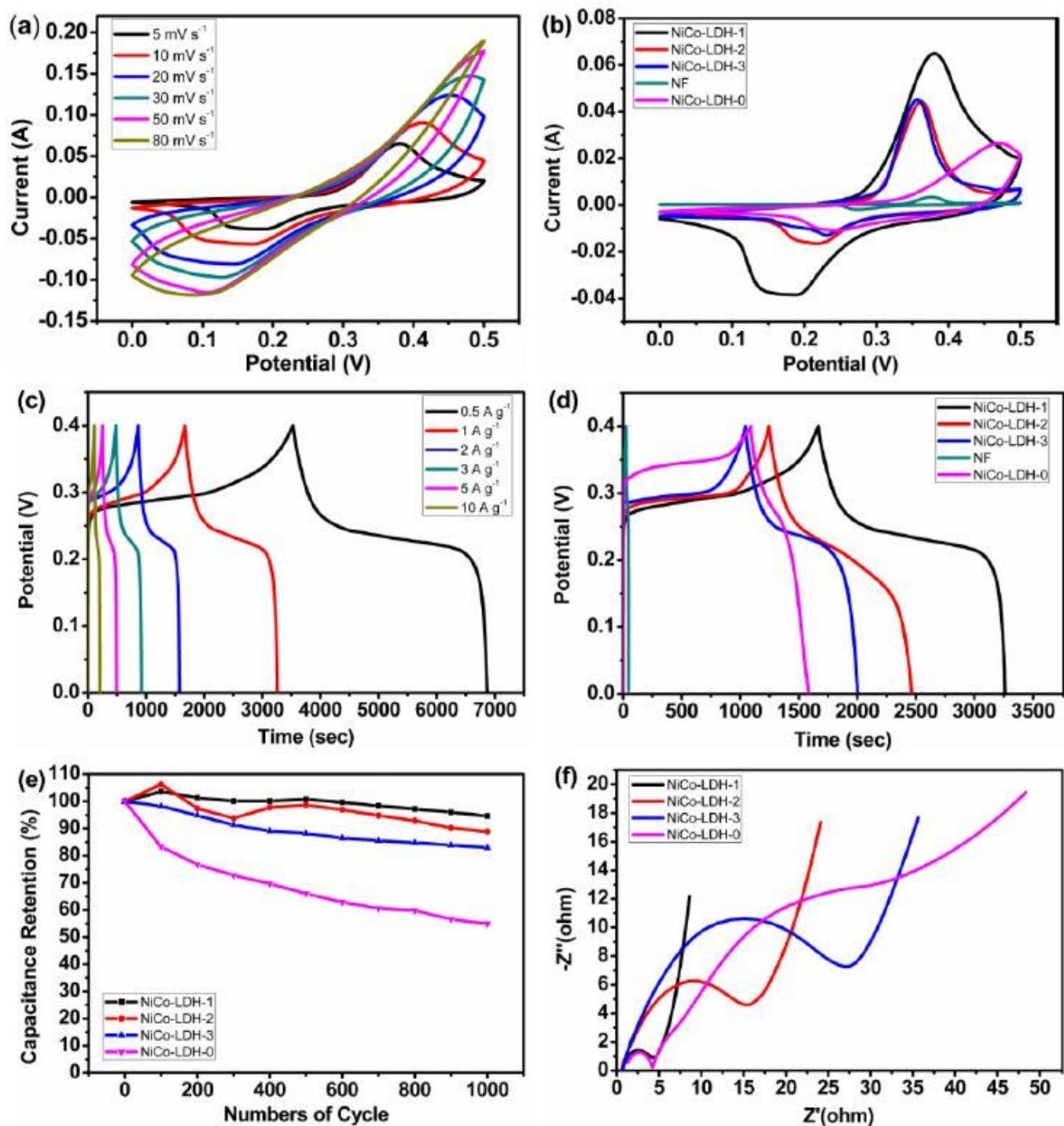


Figure 5

(a) CV curves of NiCo-LDH-1 at different scan rates; (b) CV curves of samples at scan rate of 5  $\text{mV s}^{-1}$ ; (c) GCD curves of NiCo-LDH-1 at different current densities; (d) GCD curves of samples at 1  $\text{A g}^{-1}$ ; (e) Cyclic stability diagram of NiCo-LDH-1, NiCo-LDH-2, NiCo-LDH-3 and NiCo-LDH-0 at 10  $\text{A g}^{-1}$ ; (f) Nyquist plots of NiCo-LDH-1, NiCo-LDH-2, NiCo-LDH-3 and NiCo-LDH-0.