Facile Synthesis of Ni/Co (Hydr)oxides with Nanosheet Structure for High Performance Supercapacitors

Chengyu Ma¹, Saisai Jian¹, Jinli Qiao^{1,*}, Joey Jung^{2,*}

¹ College of Environmental Science and Engineering, Donghua University, 2999 Ren'min North Road, Shanghai 201620, P. R. China

² Wattech Power Inc, 150-11120 Bridgeport Rd. Richmond BC V6X1T2, Canada

*E-mail: qiaojl@dhu.edu.cn, jjung@wattechpower.ca

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In this article, the novel kind of binary metal oxides, Ni/Co (hydr)oxides, with nanosheet structure have been successfully established via a facile hydrothermal self-assembled process with ammonia solution as the reaction reagent. The as-prepared samples with peculiar morphologies and characteristics are easily realized by just controlling the calcination temperatures. The composition, morphology, and microstructure of the products were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), high-resolution transmission electron microscopy (HR-TEM) and X-ray photoelectron spectroscopy (XPS). The thermogravimetric analysis (TGA) revealed the decomposition details of the precursor. Electrochemical measurements show that the sample calcined at 250°C has the optimized capacitive performance, demonstrated by cyclic voltammetry and galvanostatic charge-discharge cycling techniques. The Ni/Co hydroxide nanosheets as electrode materials for supercapacitor exhibit high specific capacitance of 1427 F g⁻¹ at 1 A g⁻¹, and 1270 F g⁻¹ at 10 A g⁻¹, indicating an excellent rate capability. Also, the superior cyclic stability with the capacitance retention of 92.3% is achieved even over 3000 cycles at a high current density of 10 A g⁻¹. The improved capacity and cycling stability makes it promising electrode material for offering an effective way to achieve high supercapacitor performance.

Keywords: Ni/Co (hydr)oxide; Morphology-control; Calcination temperature; Supercapacitor; Cyclic stability

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