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Synthesis of porous carbon nanosheets for use in high rate capability and long cycle life supercapacitors

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Abstract content
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Carbon-based supercapacitors are known to suffer from electrode kinetic problems that are related to the limitation of electrolyte ions penetrating the inner pores of an electrode, which should in principle improve the rate capacity in such supercapacitors. This issue still remains an ongoing challenge [1]. In this work we report a simple method to fabricate porous carbon nanosheets by carbonization of poly(vinyl alcohol) (PVA) mixed with different mass of nickel chloride hexahydrate (NiCl2.6H2O). The final product of this simple method was carbon nanosheets decorated with few layers graphene. Specific surface area above 1000 m2g-1 was obtained when 5 ml of 10% wt of PVA solution was mixed with 20 g of NiCl2.6H2O. The shape of cyclic voltammetry (CV) curves, in the 2-electrode configuration and 6M KOH aqueous electrolyte, remains rectangular-like even at high scan rate (3000 mV.s-1), in a large potential window of 1.9 V. No significant ohmic drop at current density of 10 Ag-1 was observed. These results indicate successful double layer electrochemical capacitor behaviour with low ion transport resistance and short diffusion length during charge-discharge process. No capacitance loss after 10,000 cycles at current density of 5 Ag-1 was observed, highlighting a good suitability for high rate operation. These outstanding performances of this material as an electrode for supercapacitors show great potential for high performance energy-related applications.

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