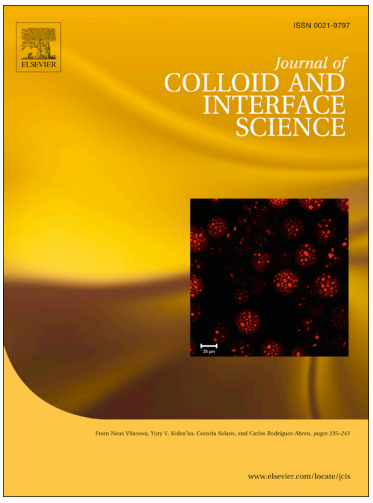

Enhanced electrochemical performance of nickel-cobalt-oxide@reduced graphene oxide//activated carbon asymmetric supercapacitors by the addition of a redox-active electrolyte

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Enhanced electrochemical performance of nickel-cobalt-oxide@reduced graphene oxide//activated carbon asymmetric supercapacitors by the addition of a redox-active electrolyte

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Abstract

Supercapacitors are an emerging energy-storage system with a wide range of potential applications. In this study, highly porous nickel-cobalt-oxide@reduced graphene oxide (Ni-Co-O@RGO-s) nanosheets were synthesized as an active material for supercapacitors using a surfactant-assisted microwave irradiation technique. The RGO-modified nanocomposite showed a larger specific area, better conductivity, and lower resistivity than the unmodified nanocomposite because the RGO facilitated faster ion diffusion/transport for improved redox activity. The synergistic effect of Ni-Co-O@RGO-s resulted in a high capacitance of 1,903 F g^{-1} (at 0.8 A g^{-1}) in a mixed KOH/redox active $K_3Fe(CN)_6$ electrolyte. The asymmetric Ni-Co-O@RGO-s//AC supercapacitor device yielded a high energy density and power density of 39 Wh kg^{-1} and 7500 W kg^{-1}, respectively. The porous structure and combination of redox couples from both the electrode and electrolyte provided a highly synergistic effect, which improved the performance of the supercapacitor device.