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Title: Synthesis of the urea-formaldehyde resin@MnO_2 core-shell nanoparticles and investigation of their performance in supercapacitors.

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Energy has been one of the important issues considered by the world powers and researchers, and many efforts has been made to invent and develop for energy storage. Capacitors as one of the storage devices has a high power density and high energy, and play a great role in the world needs. The main aim of the present research has been the preparation of the core-shell nanoparticles of the manganese dioxide and manganese disulfide with melamine-formaldehyde rsin shell as supercapacitor material. As the first step, the nanoparticles of urea formaldehyde resin were prepared and covered by the MnO_2 and MnS_2. The morphology and chemical structure of the samples has been investigated and confirmed by FT-IR, DLS, XRD and SEM techniques. The electrode prepared by using of the synthesized core-shell nanoparticles and carbon nanopowder such as Volkan were studied via cyclic voltammetry, charge-decharge technique, galvanostatic and electrochemical impedance spectroscopy. According to the results, the specific capacities obtained for the electrodes prepared by using of MnO_2, UF@MnO_2, MnS_2 and UF@MnS_2 as active electrode materials have been 358, 279, 428 and 105 $F.g^{-1}$. Electrochemical impedance spectrospy studies has indicated an almost ideal capacitive behviour for these electrodes. Also, a relatively ideal charge-decharge capacitive behavior has been observed for these electrodes.

Keywords: Supercapacitor, urea-formaldhyde resin, active carbon, specific capacity, cyclic charge-discharge

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