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Incorporation of Manganese Oxide Nanoparticles Into Polyaniline Hollow Nanospheres and Its Application to Supercapacitors

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Supercapacitors with higher energy and power density are attracting growing attention for their wide range of potential applications such as portable electronic equipments, hybrid vehicle and cellular devices. In various classes of materials for supercapacitors, the redox pseudocapacitive materials such as conducting polymers and metal oxides have been most widely studied recently. The nanostructuring of the electrode surface has also been focused on since it can provide large surface area and consequently easy diffusion of ions in the capacitors. Among the active materials, in this work, we have used polyaniline (PANi) and manganese oxide (MnO_2). PANi is one of the promising electrode and active materials due to its desirable properties such as high electrochemical activity, high doping level and stability. MnO_2 is also widely studied material for supercapacitors since it is relatively cheap and environmentally friendly. In this work, we fabricated PANi hollow nanospheres by polymerizing aniline monomers on the polystyrene (PS) nanospheres and then dissolving the inner PS spheres. This nanostructuring of the PANi surface can provide large surface area and hence easy diffusion of electrolyte ions. We also incorporated MnO_2 nanoparticles into the PANi hollow nanospheres and investigated its electrochemical properties. It is expected that the combination of these two active materials with slightly different working potential windows show synergetic effects such as broader working potential range and enhanced specific capacitance.

Keywords: Polyaniline, Manganese oxide