Biomacromolecule-Assisted Synthesis and Electrocapacitive Behavior of Manganese Ferrite Nanoparticles

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Two types of manganese ferrite nanoparticles, namely MF-SA and MF-CHI, have been synthesized solvothermally from the synthesis systems containing sodium alginate and chitosan, respectively. Both MF-SA and MF-CHI showed well crystalline nature based on the XRD and TEM measurements. The larger saturation magnetization value of MF-SA should be ascribed to its slightly larger crystallite size than that of MF-CHI. Results from N₂ adsorption-desorption isotherms and Raman spectra confirmed the structural difference in MF-SA and MF-CHI. The electrocapacitive behavior of manganese ferrite-based supercapacitors has been studied and MF-SA displayed a specific capacitance of around 60.4 F•g⁻¹ at 0.25 A•g⁻¹ in aqueous symmetric supercapacitors, larger than that of MF-CHI about 45.1 F•g⁻¹ at the same condition. MF-SA based supercapacitor also showed better capacitance maintenance of around 82% of the initial value at 1 A•g⁻¹ after 2000 cycle test than that of MF-CHI based cells. Based on the experimental data, the structure-property relationship of two types of MnFe₂O₄ nanoparticles have been discussed and analyzed.

Keywords: Ferrite, Nanoparticle, Marine biomolecule, Raman spectroscopy, Supercapacitor

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