Li and Na Storage Behaviours of MgFe_2O_4 Nanoparticles as Anode Materials for Lithium Ion and Sodium Ion Batteries

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Porous structured MgFe_2O_4 particles were successfully prepared via a simple and low-cost route by sol-gel combustion synthesis. The final product was characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM). The average diameter of the prepared MgFe_2O_4 particles was found to be approximately 41 nm. When used as an anode material of lithium ion batteries (LIBs), MgFe_2O_4 showed an excellent cycling performance and a fairly high rate performance. The good Li storage performance can be attributed to the uniform porous structure without impurities that accommodates the strain due to the volume change in the charge/discharge cycles and expands the active area for lithium ion insertion. Additionally, the Na storage properties of MgFe_2O_4 as an anode material of sodium ion batteries were studied, and similar characteristics to those of LIBs were obtained during the discharge/charge cycles, with a high capacity in the initial discharge process but relatively moderate capacity retention compared to that found in the study of Li storage properties.

Keywords: Lithium ion batteries, Sodium ion batteries, MgFe_2O_4 , Electrochemical performance, Anode materials

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