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Synthesis and Characterization of $Mn_xZn_{1-x}Fe_2O_4$ Nanoparticles by a Reverse Micelle

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The preparation of $Mn_xZn_{1-x}Fe_2O_4$ nanoparticles in Igepal CO-520-cyclohexane water reverse micelle solutions has been studied. Transmission electron microscopy and X-ray diffraction pattern analyses revealed the resultant particles to be $Mn_xZn_{1-x}Fe_2O_4$. The average size and distribution of synthesized particles calcined at 600℃ for 2hrs were in the range of 30 to 70nm and broaden, respectively. The phase of synthesized particles was crystalline. The magnetic behavior of the synthesized particles was ferromagnetism. The effect of synthesis parameters, such as the molar ratio of water to surfactant and calcination temperature, are discussed.

Keywords: MnxZn1-xFe2O4 Nanoparticles, Reverse Micelle

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Li Intercalations in Single Crystalline Nanowires as Anode Materials for Lithium Ion Battery

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Studies of the anode materials in lithium-ion rechargeable batteries are focusing on the metal oxides and metal alloys due to their specific capacity much higher than the already-commercialized graphite. However, large volume changes in these materials in the course of Li^+ intercalation cause internal damages and resulting in loss of capacity and rechargeability. In this regard, one dimensional oxide and alloy nanostructure such as nanowires can be explored as anode materials due to their high surface area that could compensate the damages.

Herein, we report Li intercalation behavior of single crystalline oxide (SnO_2, ZnO) and non-oxide (Si) nanowires as anode materials for Li ion batteries. SnO_2, ZnO, and Si nanowires were synthesized by a conventional chemical vapor deposition (CVD) process. Li ion half cells were then fabricated using nanowires and the reversible capacity was measured by conducting constant current charge/discharge experiments between the potential limits of 0.2 V and 3 V versus Li^+/Li. The half cell with Si nanowires faded the discharge capacity due to volume expansion of the nanowires. Meanwhile, SnO_2 and ZnO nanowires showed successful intercalation of Li up to 30th cycles with good capacity retention (60% of first cycle). The advantage of nanowires as anode materials for Li ion batteries will be discussed based on these results.

Keywords: nanowires, energy conversion, Lithium secondary battery