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One-step synthesis of hematite nanospindles from choline chloride/urea deep eutectic solvent with highly powerful storage versus lithium

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Abstract

Fe_2O_3 nanospindles assembled with nanoparticles as primary building blocks are directly synthesized by a versatile ionothermal strategy in the choline chloride/urea mixture-based deep eutectic solvent system. The proposed ionothermal protocol is attractive and environmental friendly because choline chloride and urea are both naturally biocompatible compounds. As an anode material for lithium-ion batteries, the resultant Fe_2O_3 nanospindles show high capacity and good cycle stability (921.7 mAh g^{-1} at a current density of 200 mA g^{-1} up to 50 cycles), as well as the excellent rate capability. The good electrochemical performance can be attributed to the nanospindle structure with high sufficient interfacial contact area between the active material and electrolyte, the short diffusion distance of Li ions. The environmentally benign strategy proposed in this study is expected to offer an attractive technique for the ionothermal synthesis of electrochemical energy storage materials.

Keywords: Hematite; Nanospindle; Deep eutectic solvent; Anode; Lithium ion battery

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