VIDEO ARTICLE

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Tin-based Anode: New Phase and Its Application in Lithium and Sodium Batteries

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Abstract

MSn_5 (M=Fe, Co, $Fe_{0.5}Co_{0.5}$) intermetallics are a series of newly discovered Sn-based alloys by Han's group. Because of the high theoretical lithium storage capacities and novel magnetic properties, these intermetallics are showing broad application prospects in energy storage, catalysis, and magnetism. MSn_5 (M=Fe, Co, $Fe_{0.5}Co_{0.5}$) intermetallics can be synthesized through a polyol method using β-Sn nanospheres as templates. It was found that Kirkendall diffusion process rather than galvanic replacement reaction occurs when M metals permeate into Sn nanocrastals to form MSn_5 (M=Fe, Co, $Fe_{0.5}Co_{0.5}$) intermetallics. Although the nickel shows many common physical and chemical properties with iron and cobalt, we failed to synthesize $NiSn_5$ intermetallic using the same approaches of preparing MSn_5. Here, we report the first successfully obtained a metastable $NiSn_5$ intermetallic phase. Metallic Sn-based anodes are perceived as one of the most promising alternatives to the conventional graphite anode and have attracted great attention due to the high theoretical capacities of Sn in both lithium-ion batteries (LIBs) (994 mA h g^{-1}) and sodium-ion batteries (847 mA h g^{-1}). In this talk, the latest and most outstanding developments in metallic Sn-based anodes for LIBs and SIBs are also reported.

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