Low-temperature performance of Sn_xP/C composite nanofibers as free-standing anode materials for lithium-ion batteries

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Graphite anode is admitted as one of the critical limiting factors for applying lithium-ion batteries (LIBs) in low-temperature (LT) environments. As an alternative, tin compounds, such as SnO_2, exhibit much better LT performance owing to the unique allotropic changes of tin and increased reversibility of lithiation-delithiation reactions at low temperatures. However, to the best of our knowledge, LT performance of Sn_xP as anode for LIBs has not been reported so far.

In this work, Sn_xP-based free-standing carbon composite nanofiber mats have been successfully synthesized by electrospinning with heat treatments and applied as anode materials for LT LIBs. The material, prepared under optimal conditions showed 6 times higher capacity (900 mAh g^{-1}) at 0 ^oC compared to commercial graphite anode and improved cycle stability than pure Sn at a current density of 50 mA g^{-1}.

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