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Advanced high-capacity electrode architectures for lithium-ion batteries

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ABSTRACT

The objective of this discussion is to demonstrate a high-capacity, carbon-metal composite based anode material architectures for lithium ion battery applications. These electrode materials are fabricated using a scalable, solid-state synthesis method starting with simple, inexpensive, and environmentally benign precursors. The specific anode materials to be presented include carbon-metal (or oxide) composites made with energy dense Sn, Sb, Si, and Co. In addition, a comprehensive study will be presented on the electrolyte additives to optimize the capacity of the final material. For example, 5nm SnO_2 particles with high BET surface area were prepared. Battery cells comprising C/SnO_2 vs Li were cycled in a voltage range from 0.01V to 1.5V and achieved 450 mAh/g stable capacities at 2C rate (30 min charging and 30 min discharging) even after 50 cycles. Materials synthesis, detailed morphological, structural, compositional studies, and long cycling capability of the newly developed anode-based electrode architectures will be demonstrated.