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A novel method to synthesize vanadium nitride nanopowders by ammonia reduction from combustion precursors

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Vanadium nitride(VN) has many applications ranging from structural materials to electrode material owing to its high hardness, excellent wear resistance, high electrical and thermal conductivity and high-temperature stability. The conventional synthesis methods are often plagued by high temperature (above 1000 °C) and long reaction times. In the paper, VN nanopowders are firstly synthesized by a large-scale, low-temperature and short-time solution combustion synthesis-based method. Firstly, vanadium dioxide(VO_2) precursors are prepared through ultrafast (within one minutes) solution combustion synthesis method. During the subsequent ammonia reduction process, the VN nanopowders are successfully obtained at 700°C for 2h. In the investigation, the phase transformations and microstructures of precursors during ammonia reduction procedure have been studied in detail. The as-prepared VN nanopowders are composed of nanoparticles with particles sizes ranging from 30 to 40 nm and possess mesoporous structures. Upon evaluating the VN nanopowder as an anode material for lithium ion batteries, it displays good electrochemical

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