Hierarchical nanorod-based TiO_2 microspheres for superior electrochemical energy storage

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ABSTRACT

Nanorod-based rutile TiO_2 microspheres composed of numerous single-crystalline nanorodsare successfully fabricated by hydrothermal treatment of peroxo titanic acid in acidic solution. The formation of highly oriented nanorod-based microspheres can be explained in view of crystal growth under the coordination chemistry rule, followed by particle attachment and coalescence. As anodes for Li-ion batteries, the TiO_2 microsphere electrodes show enhanced rate performance, deliver a high reversible specific capacity of 180 mAh g^{-1} at 0.2 C (33.6 mA g^{-1}) and 85.6 mAh g^{-1} at an extremely high rate of 50 C with an outstanding retention of 47.5%. These remarkable electrode properties are attributed to the efficient electron-transport by the hierarchical conductive pathway which promoted electronic conductivity and the shortened Li^+ diffusion length resulting from the ultrafine nanorod structure.

KEYWORDS:

Battery; High rate; TiO_2; Microspheres