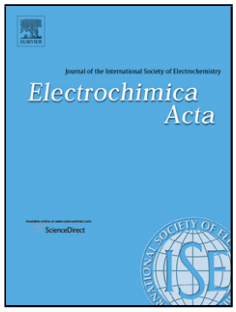

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$TiNb_2O_7$/Graphene hybrid material as high performance anode for lithium-ion batteries

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Abstract

We report the synthesis of $TiNb_2O_7$/Graphene (TNO-TG) hybrid nanomaterial by simple solvothermal process, with $TiNb_2O_7$ nanoparticles anchored on the reduced graphene oxide (rGO) sheets. TNO-TG hybrid nanomaterial showed excellent electrochemical performance when studied as anode for Lithium-ion battery, with an exceptionally high rate capability (capacity retention of 80% at 16 C rate) along with high discharge capacity (~ 230 $mAhg^{-1}$ after 50 cycles at 0.1 C). A full cell Li-ion battery has been fabricated with TNO-TG as anode and $LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$:$LiNi_{0.5}Mn_{0.5}O_2$ (wt% of 75:25) as cathode, which delivered an average cell voltage of ~2.5 V with an initial anode-specific discharge capacity of 211 $mAhg^{-1}$, when cycled in the voltage range of 1.5 - 3.5 V at 0.1 C. The obtained results are very promising and we believe the current findings will lead to new directions in the on-going search for safe and high performance anodes for rechargeable lithium-ion batteries.

Key words: Nanocomposite material; Anode material; Charge-discharge cycling; High rate capability; Lithium-ion battery.

1. Introduction