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## TiNb<sub>2</sub>O<sub>7</sub>/Graphene hybrid material as high performance anode for lithium-ion batteries

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Abstract

We report the synthesis of TiNb<sub>2</sub>O<sub>7</sub>/Graphene (TNO-TG) hybrid nanomaterial by simple solvothermal process, with TiNb<sub>2</sub>O<sub>7</sub> 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<sup>-1</sup> after 50 cycles at 0.1 C). A full cell Li-ion battery has been fabricated with TNO-TG as anode and LiNi<sub>1/3</sub>Mn<sub>1/3</sub>Co<sub>1/3</sub>O<sub>2</sub>:LiNi<sub>0.5</sub>Mn<sub>0.5</sub>O<sub>2</sub> (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<sup>-1</sup>, 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

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