The promising Sb_2Se_3-TiC-C nanocomposites for High-performance Lithium ion Batteries

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Lithium ion batteries (LIBs) have been paid attention to solve the energy insufficiency due to their high power and energy densities. Graphitic carbon based materials now we commercially use just provide a relatively low capacity (100~300 $mAhg^{-1}$). As an alternative anode material, we focus on Sb_2Se_3 because of its superior theoretical capacity which is calculated to be 670$mAhg^{-1}$. However, both Sb and Se suffer from their unexpected volume expansion, contraction during Li (de)alloying. In this respect, for improving the performance of LIBs, the composites are prepared by high energy mechanical milling (HEMM) after Sb-Se-Ti mixtures are annealed at high temperature. Antimony selenide (Sb_2Se_3) are dispersed in a conductive hybrid matrix made up of titanium carbide (TiC)-carbon (C) and carbon (C). The introduction of hybrid matrix leads to better cyclic performance compared to metal alloys dispersed in a simple carbon matrix. In this study, the function of hybrid matrix will be discussed.