Facial synthesis of Ge/rGO composite for high-performance lithium ion batteries

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Germanium (Ge) is considered as a promising anode material for lithium ion batteries (LIBs) due to its high theoretical specific capacity (1600 mAh g^{-1}). However, owing to the huge volume variation during cycling, the batteries based on Ge anodes usually show poor cyclability and inferior rate capability.[1, 2] Herein, we demonstrated a facial strategy to synthesize germanium/reduced graphene oxide composite (Ge/rGO) with Ge nanoparticles wrapped by conductive rGO nanosheets, which can accommodate huge volume variations of Ge and improve its electronic conductivity. When employed as anode for lithium ion batteries (LIBs), the as-obtained Ge/rGO exhibits excellent electrochemical performance and has a potential for further application of high energy and power density LIBs.

The diffraction peaks of Ge/rGO are well indexed as cubic structure Ge (JCPDS No. 04-0545) as shown in Figure 1a. Ge/rGO composite with a range of 1-8 μm show uniform spherical structure (Figure 1b).[3] Figure 1c shows the typical discharge/charge voltage profiles for the Ge/rGO composite at a current rate of 1 C (1 C=1.6 A g^{-1}) with an initial coulombic efficiency of 64.1%. The Ge/rGO electrode exhibits a high reversible capacity of 947 mAh g^{-1} after 200 cycles, which could be attributed to uniform spherical structure with stong structural stability.

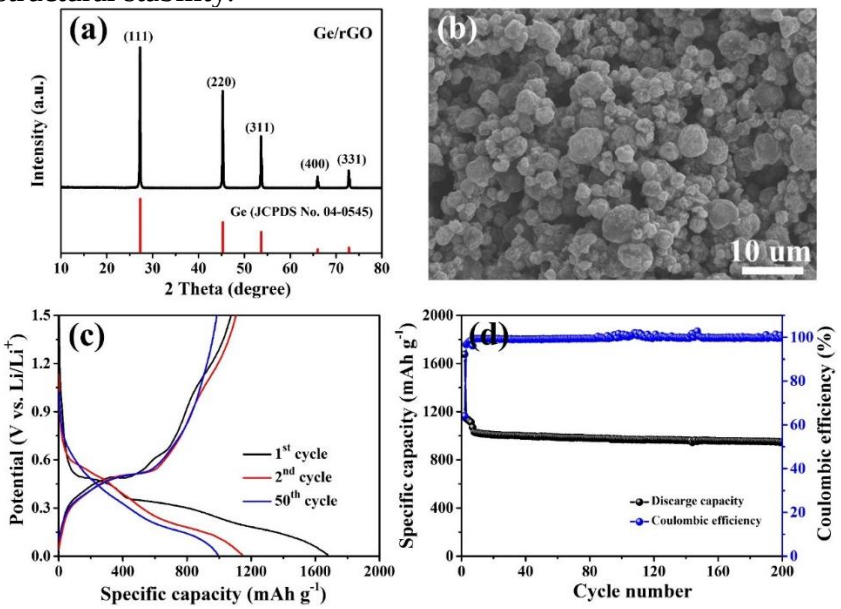

Figure 1. (a) XRD pattern and (b) SEM image of Ge/rGO composite; (c) galvanostatic discharge-charge profiles for different cycles and (d) cycling performance of Ge/rGO electrodes at 0.2 C for the first 5 cycles followed by 1 C for subsequent cycles

References:

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