Ultrafast synthesis of graphene-SnO_2 by microwave for lithium ion batteries

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Graphite is famous for an anode material in lithium-ion battery. However, the low theoretical capacity (372 mAh g^{-1}) could not be satisfied with the demand of high energy density for electrical vehicles and devices. For this reason, graphene-metal oxide composite can be a solution to increase the capacity. Especially, SnO_2 nanoparticles are a promising anode material for the lithium ion battery. Graphene-SnO_2 (G-SnO_2) can be synthesized by vacuum filtration and microwave. For example, reduced graphene oxide (rGO) and graphene oxide (GO) were uniformly dispersed in 2-propanol. The mixture was stirred with $SnCl_2$ solution, and then a hydrogel was formed by vacuum filtration. Finally, the hydrogel transformed to the G-SnO_2 through it was exposed to the microwave irradiation for 10min. The capacity of G-SnO_2 showed around 1,000 mAh g^{-1} in 100 mA g^{-1} during 100 cycles, and maintained high specific capacity (746.8 mAh g^{-1}) in high current density (300 mA g^{-1}). In addition, properties of G-SnO_2 were analyzed by SEM, TEM, XRD, XPS, TGA and cycle voltammetry.