Titanium doped graphene/carbon aerogels as cathode materials for lithium sulfur batteries

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Abstract: As a new type of secondary battery system, lithium sulfur battery has been widely concerned because of its theoretical specific capacity of 1675 mAh/g [1]. However, the cycle stability of the battery is poor due to the active material of the positive electrode is not conductive and the "shuttle effect" is easy to occur in the process of electrode reaction [2-4]. A graphene/carbon aerogel with three-dimensional porous network structure was constructed by sol-gel technique, supercritical drying and carbothermal reduction process. The high specific surface area (725.58 m^2/g) and the appropriate pore volume (0.32 cm^3/g) provide a channel for lithium ion transport. At the current density of 100 mA/g, the first charge and discharge specific capacity reach to 682 mAh/g. Titanium doped graphene/carbon aerogels was filled by vacuum impregnation. With the titanium dioxide filled the pores of aerogels, the specific surface area (554.77 m^2/g) and pore volume (0.24 cm^3/g) are decreased. However, the first charge/discharge specific capacity (827 mAh/g at 100 mA/g) is increased. It is worth noting that the first cycle efficiency of titanium doped graphene/carbon aerogels reached 91.05%. This material is expected to be used in the cathode material of lithium sulfur battery.
Key Words: graphene aerogels; carbon aerogels; titanium doped; lithium sulfur battery

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