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**Electrochemical properties of amorphous GeO<sub>x</sub>-C composite microspheres prepared by a one-pot spray pyrolysis process**

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**Abstract**

Amorphous GeO<sub>2</sub>-GeO-C (GeO<sub>x</sub>-C) composite powders, containing a small amount of the GeC phase, are prepared by a one-pot spray pyrolysis process. The GeO<sub>x</sub>-C composite powders have a completely spherical shape and are non-aggregated. The Ge 3d components in the XPS spectrum of the composite occupy 53.3, 40.1, and 6.6 % of the total for GeO<sub>2</sub>, GeO, and GeC, respectively. The amount of amorphous carbon in the GeO<sub>x</sub>-C composite powder is estimated at 18.3 %, based on the TG and XPS analysis. The initial discharge and charge capacities of the GeO<sub>x</sub>-C composite powders at a current density of 1 A g<sup>-1</sup> are 1873 and 908 mA h g<sup>-1</sup>, respectively. The discharge capacities of the GeO<sub>x</sub>-C composite and commercial GeO<sub>2</sub> powders for the 1200<sup>th</sup> cycle are 723 and 169 mA h g<sup>-1</sup>, respectively, and their corresponding capacity retentions from the 2<sup>nd</sup> cycle are 70.1 and 19.0 %, respectively. The high structural stability of the composite during repeated lithium insertion and desertion processes results in excellent long-term cycling performance.

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