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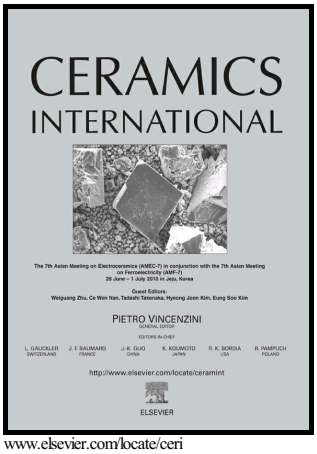

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Electrochemical properties of amorphous GeO_x-C composite microspheres prepared by a one-pot spray pyrolysis process

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Abstract

Amorphous GeO_2-GeO-C (GeO_x-C) composite powders, containing a small amount of the GeC phase, are prepared by a one-pot spray pyrolysis process. The GeO_x-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_2, GeO, and GeC, respectively. The amount of amorphous carbon in the GeO_x-C composite powder is estimated at 18.3 %, based on the TG and XPS analysis. The initial discharge and charge capacities of the GeO_x-C composite powders at a current density of 1 A g^{-1} are 1873 and 908 mA h g^{-1}, respectively. The discharge capacities of the GeO_x-C composite and commercial GeO_2 powders for the 1200th cycle are 723 and 169 mA h g^{-1}, respectively, and their corresponding capacity retentions from the 2nd 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.