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Author: Xuelian Liu Yuxi Chen Hongbo Liu Zhi-Quan Liu

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SiO_2@C Hollow Sphere Anodes for Lithium-ion Batteries

Xuelian Liu[1], Yuxi Chen[1]*, Hongbo Liu[1], Zhi-Quan Liu[2]

[1]College of Materials Science and Engineering/Hunan Province Key Laboratory for Spray Deposition Technology and Application, Hunan University, Changsha 410082, China

[2]Shenyang National Laboratory for Materials Science, Institute of Metal Research, Chinese Academy of Sciences, Shenyang 110016, China

* Corresponding author. Tel: +86 731 88664018; Fax:+86 731 88823554.

E-mail address: yxchen@hnu.edu.cn (Y.X. Chen).

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As anode materials for lithium-ion batteries, SiO_2 is of great interest because of its high capacity, low cost and environmental affinity. A facile approach has been developed to fabricate SiO_2@C hollow spheres by hydrolysis of tetraethyl orthosilicate (TEOS) to form SiO_2 shells on organic sphere templates followed by calcinations in air to remove the templates, and then the SiO_2 shells are covered by carbon layers. Electron microscopy investigations confirm hollow structure of the SiO_2@C. The SiO_2@C hollow spheres with different SiO_2 contents display gradual increase in specific capacity with discharge/charge cycling, among which the SiO_2@C with SiO_2 content of 67 wt% exhibits discharge/charge capacities of 653.4/649.6 mA h g^{-1} over 160 cycles at current density of 0.11 mA cm^{-2}. The impedance fitting of the electrochemical impedance spectroscopy shows that the SiO_2@C with SiO_2 content of 67 wt% has the lowest charge transfer resistance, which indicates that the SiO_2@C hollow spheres is promising anode candidate for lithium-ion batteries.

Key words: Silica; Hollow spheres; Carbon coating; Anode; Lithium-ion batteries