

Accepted Manuscript

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PII: S1385-8947(18)31883-7
DOI: <https://doi.org/10.1016/j.cej.2018.09.163>
Reference: CEJ 20002

To appear in: *Chemical Engineering Journal*

Received Date: 13 June 2018
Revised Date: 1 August 2018
Accepted Date: 21 September 2018



Please cite this article as: X. Zhang, L. Huang, P. Zeng, L. Wu, Q. Shen, Z. Gao, Y. Chen, Hierarchical MoS₂ anchored on core-shell Si@C with increased active-sites and charge transfer for superior cycling and rate capability in lithium-ion batteries, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.09.163>

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Hierarchical MoS₂ anchored on core-shell Si@C with increased active-sites and charge transfer for superior cycling and rate capability in lithium-ion batteries

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Abstract: Size-controlling and in situ hybridization of two or more active materials have been considered as promising strategies to accommodate the volume variation and enhance the conductivity of silicon, resulting in excellent electrochemical performance in lithium-ion batteries (LIBs). Herein, sandwich-like Si@C@MoS₂ composite containing core-shell Si@C with interconnected MoS₂ nanosheets decorated on was fabricated by molten salt magnesiothermic reduction, resorcinol formaldehyde (RF) coating and hydrothermal process. Moreover, to optimize the electrochemical properties, Si@C@MoS₂ composite with different contents of MoS₂ were also studied. Especially, Si@C@MoS₂-0.1 composite exhibits a reversible capacity of 1365.7 mAh g⁻¹ at 0.5 A g⁻¹ after 500 cycles, accompanying by a high initial coulombic efficiency of 81.5 %, and superior rate capability of ~ 872.4 mAh g⁻¹ at 10.0 A g⁻¹. Moreover, the full cell that assembled by the pretreated Si@C@MoS₂-0.1 electrode as anode and commercial LiCoO₂ as cathode also delivers

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