Silicon Oxycarbide for High-Performance Sodium Ion Battery Anodes

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Silicon oxycarbides (SiOCs), which has been studied as an anode material for lithium ion batteries (LIBs) [1,2], do not get much attention in areas of sodium ion batteries (NIBs). Based on our previous study, SiOCs produced from silicone oil presented a promising electrochemical performance when being utilized as NIB anodes, with an excellent stability during long-term cycling. In this study, effects of different pyrolysis temperatures of silicone oil under a H_2/Ar flow condition were investigated. The silicone oil was heat-treated at a wide range temperatures 700-1400 °C. The produced SiOCs at different temperatures exhibited a variety of morphology, composition, and physicochemical properties. High-pyrolysis-temperature SiOCs demonstrated noticeably different electrochemical performances as compared to low-pyrolysis temperature SiOCs, especially in terms of the ratio between plateau and sloping capacities (C_p/C_s). The SiOC sample produced at 900 °C exhibited the highest total capacity of 194 mAh g^{-1}, but low C_p/C_s of 0.15. On the other hand, the SiOC produced at 1400 °C presented total capacity of only ~160 mAh g^{-1}, while giving the highest C_p/C_s of 0.52 These results can also provide an insight into its sodium ion storage mechanism, which will be further discussed in this presentation.

References:

[1] H. Fukui, H. Ohsuka, T. Hino, K. Kanamura, ACS Appl. Mater. Interfaces 2 (2010) 998-1008.
[2] X. Liu, M.C. Zheng, K. Xie, J. Power Sources 196 (2011) 10667-10672.