SnSe@porous carbon nanofibers as a free-standing anode for low-temperature lithium-ion batteries

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Tin selenide-based materials are considered to be promising high-capacity anode materials for Li-ion batteries (LIBs) owing to their non-toxicity, earth-abundance, and chemical stability. However, SnSe suffers from a large volume expansion, which leads to poor cycling performance. In addition, it lacks in-depth research on low-temperature electrochemical performance. Here, SnSe@porous carbon nanofiber material was synthesized by the electrospinning method with consequent heat treatment and employed as a free-standing and slurry anode material at room and low temperatures. The pores in carbon nanofibers can help to suppress the volume change of SnSe during lithiation/delithiation as well as give additional insertion sites for lithium ions. X-ray diffraction (XRD) analysis and scanning electron microscope (SEM) observation were carried out to show the composition, diameter, and structure of synthesized SnSe@porous carbon nanofibers. The obtained material exhibits good mechanical flexibility and better electrochemical performance at low temperatures in comparison to commercially-available anode materials.

Acknowledgement

This research was supported by the research grant OPFE2021001 from the Ministry of Digital Development, Innovations and Aerospace Industry of the Republic of Kazakhstan