Anode Material for Lithium-Ion Batteries Based on MoS₂ and Conductive Polymer Binder: Effects of Electrode Thickness

A. I. Volkov, E. G. Tolstopjatova, V. V. Kondratiev*

Institute of Chemistry, Saint Petersburg State University, Universitetskaya nab. 7/9, Saint Petersburg, 199034

*E-mail: vkondratiev@mail.ru

Received: 5 June 2021 / Accepted: 20 July 2021 / Published: 10 September 2021

High specific capacity of anode materials based on MoS₂ is attractive for their use in lithium-ion batteries. However, low cycling stability of bulk MoS₂ and complicated conversion mechanism of charge storage are major challenges for adoption of such materials as anodes for lithium-ion batteries. In this work, we focus on the effects of electrode thickness on electrochemical performance of anodes based on MoS₂. We assess whether variation of thickness is a viable strategy to enhance the stability of such materials. Among electrodes with thickness varied within 70-250 μm, those with 100 μm to 150 μm material thickness display the most favorable rate capability in galvanostatic charge-discharge tests (32% of initial capacity at 2 A g⁻¹), which is linked to their low charge transfer resistance, as shown by electrochemical impedance spectroscopy. We also show that conductive polymer binder based on PEDOT:PSS and CMC facilitates charge transfer, as compared to conventional PVDF binder. Electrochemical studies and investigations with SEM, HR-XRD, and XPS methods show that irreversible processes occur in the electrodes and point at the necessity of substantial MoS₂ materials modification to preserve their stability.

Keywords: anode material; conducting polymer; PEDOT:PSS; molybdenum disulfide; electrode thickness; lithium-ion batteries

[FULL TEXT](#)

© 2021 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).