High-Rate Performance All-Solid-State Li-SeS₂ Battery with Selenium sulphide/three-dimensional graphene as cathode material

Wenyan Li¹, Fangchao Liu^{1,*}, Zhongli Shen¹, Han Hu¹ and Zhengwen Fu²

¹ School of Materials Engineering, Shanghai University of Engineering Science, Shanghai 201600, P.R China;

² Department of Chemistry, Shanghai Key Laboratory of Molecular Catalysis and Innovative Materials, Fudan University, Shanghai, 200433, P.R China.

*E-mail: 84309286@qq.com

doi: 10.20964/2021.07.58

Received: 13 March 2021 / Accepted: 6 May 2021 / Published: 31 May 2021

Selenium sulfide (SeS₂) shows attractive advantages of high capacity for lithium storage. Here, a free-standing ultra-high dispersion Selenium sulfide three-dimensional graphene (SeS₂-3DG) was synthesized and used as a cathode material in all-solid-state Lithium-Selenium sulfide (Li-SeS₂) batteries for enhancing rate performance and utilization of SeS₂. SeS₂-3DG achieved the utilization rate of 103% with capacity of 1,163 mAh g⁻¹ and remained 538.56 mAh g⁻¹ after 20 cycles under 1/2C. It should be noted that SeS₂-3DG exhibited outstanding rate performance, which discharged under 7C with capacity as high as 990 mAh g⁻¹. Due to the high utilization rate of SeS₂, charge and discharge products of Li-SeS₂ batteries were observed by high-resolution transmission electron microscopy (HRTEM) and selected area electron diffraction (SAED). The mechanism of lithium sulfide (Li₂S)/ Lithium selenide (Li₂Se) ↔ SeS₂ was confirmed.

Keywords: Ultra-high dispersion, All-solid-state, Li-SeS₂ batteries, Charge and discharge products, High utilization

[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/>).