Contribution ID: **94** Type: **Poster**

A solid-state electrolyte interface layer-amphiphilic polymer/metal composite nanoarray for lithium metal battery

Tuesday, 9 April 2024 18:30 (20 minutes)

Due to the urgent demand for high-energy-density batteries, lithium (Li) metal batteries (LMBs) have garnered increasing attention. However, the development of LMBs has been hindered by limited cycle life and safety concerns arising from side reactions between lithium metal and the electrolyte, as well as the formation of unstable solid electrolyte interfaces. To address this issue, a nanostructured substrate was fabricated on copper foil by adjusting the ratio of the flexible block copolymer (PS-b-PEO) and LiTFSI. Subsequently, High Power pulse magnetron sputtering (HiPIMS) technology was employed to deposit a layer of gold nanolayer onto PS-b-PEO/LiTFSI, creating an artificial solid electrolyte interface layer of a polymer/metal composite nanoarray.

This experimental setup was conducted using the in-situ scattering device located at the Synchrotron Radiation Center in Hamburg, Germany. On one hand, it facilitated the preparation of the solid electrolyte interface layer in the amphiphilic polymer/metal composite nanoarray. On the other hand, it provided insights into the role of gold nanoparticles in the nanometer-sized particle structural block copolymer surface deposition behavior. The gold nanoparticles within the constructed polymer/metal composite nanoarray's artificial solid electrolyte interface layer effectively reduce the nucleation potential energy, and the polymer substrate helps mitigate the powdering of gold nanoparticles, thereby stabilizing the interface layer and enhancing the stability of the Li||Cu cells.

Primary authors: XU, Zhuijun (Technische Universität München); PAN, Guangjiu (Technische Universität München, Fakultät für Physik, Lehrstuhl für Funktionelle Materialien); JIANG, Xiongzhuo (Physics Department, TU Munich); LIANG, Suzhe (Physical Department, TUM); BULUT, Yusuf; Mr RECK, Kristian A. (Chair for Multicomponent Materials, Department of Materials Science, Kiel University); Mr STRUNSKUS, Thomas (Chair for Multicomponent Materials, Department of Materials Science, Kiel University); Prof. FAUPEL, Franz (Chair for Multicomponent Materials, Department of Materials Science, Kiel University); Prof. XIA, Yonggao (Ningbo Institute of Materials Technology & Engineering, Chinese Academy of Sciences); Prof. CHENG, Ya-jun (Ningbo Institute of Materials Technology & Engineering, Chinese Academy of Sciences); ROTH, Stephan (DESY / KTH); MÜLLER-BUSCHBAUM, Peter (TU München, Physik-Department, LS Funktionelle Materialien)

Presenter: XU, Zhuijun (Technische Universität München)

Session Classification: Posters

Track Classification: MLC