NAPLES, ITALY 23-27 JUNE
DSL2025 NAPLES
21st International Conference on Diffusion in Solids and Liquids

ABSTRACT

Evaluation of Morphology and Structure of Battery Separators using Corelative Microscopy and Diffraction Methods

G.Simha Martynková[1]

[1]Nanotechnology Centre, CEET, VŠB-Technical University of Ostrava, 17.listopadu 15, Ostrava-Poruba, Czech Republic.

Battery separators play a crucial role in the performance and safety of energy storage systems, influencing ion transport, electrochemical stability, and overall battery lifespan. A comprehensive evaluation of their surface morphology, defects in the structure or chemical influence is essential for optimizing separators properties and enhancing battery efficiency [1]. This study employs a correlative microscopy, integrating scanning electron microscopy (SEM), and atomic force microscopy (AFM) to examine the microstructural features and surface topology of battery separators before and after failure. Additionally, X-ray diffraction (XRD) methods with EDS chemical analysis are utilized to investigate the structure properties and phase-changes in the polymeric separator. The findings indicate that changes in separator features, such as porosity, thickness, and mechanical properties, are closely linked to different battery failure mechanisms. Structural degradation, thermal shrinkage, and chemical instability can lead to performance loss, dendrite formation, and short circuits. Based on these insights, it is possible to suggest that various battery failures arise due to alterations in separator properties, emphasizing the need for tailored material design and manufacturing processes.

Aknowledgement: This work was created under project No.CZ.02.01.01/00/22_008/ 0004631 MATUR within the JAK OP and the REFRESH–project number CZ.10.03.01/00/22_003/ 0000048 via the OPJT.

[1] S.Pakseresht, D.Kuruahmet, A.Guler, S.O.Duman, H.Gungor, B.Cetinkaya, G.S. Martynkova. Journal of the Electrochemical Society.169(1):010534, (2022).