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Perfluoropolyether based polymer coatings for iinterfacial stability in lithium-based batteries

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Lithium metal batteries are next-generation energy storage devices that rely on the stable electrodeposition of lithium metal during the charging process. A major challenge associated with this battery chemistry is related to the uneven Li deposition that leads to dendritic growth and poor coulombic efficiency (CE). A promising strategy for addressing this challenge is utilizing a polymer coating on the anodic surface to protect it and improve interfacial stability.
In this contribution, we demonstrate the influence of mechanical strengths in perfluoropolyether based polymer coatings on battery performance, and show that batteries prepared with polymer coatings having lower mechanical strength and better flowability exhibit higher CEs and a homogeneous Li deposition in comparison to those prepared using mechanically rigid polymers [1]. Further, we investigate polymer dynamics as a function of mechanical strength and/or Li salt using QENS in an attempt to correlate the observed dynamics with their viscosity and ionic conductivity.

[1] Huang, Z. ; Choudhury, S. ; Paul, N. ; Thienenkamp, J. H. ; Lennartz, P. ; Gong, H. ; Müller-Buschbaum, P. ; Brunklaus, G. ; Gilles, R. ; Bao, Z. Effects of Polymer Coating Mechanics at Solid-Electrolyte Interphase for Stabilizing Lithium Metal Anodes, Adv. Energy Mater. 2022, 12, 2103187.

Primary authors: Dr PAUL, Neelima (Technical University of Munich, Heinz Maier-Leibnitz Zentrum (MLZ)); HUANG, Zhuojun; CHOUDHURY, Snehashis; THIENENKAMP, Johannes Helmut; LENNARTZ, Peter; GONG, Huaxin; SARTER, Mona; MÜLLER-BUSCHBAUM, Peter (TU München, Physik-Department, LS Funktionelle Materialien); BRUNKLAUS, Gunther; GILLES, Ralph; BAO, Zhenan

Presenter: Dr PAUL, Neelima (Technical University of Munich, Heinz Maier-Leibnitz Zentrum (MLZ))