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A capillary battery cell setup for in-operando x-ray investigation of solid polymer electrolytes

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Lithium-Ion Batteries turned out as an indispensable energy supplier in modern society which however suffers from safety concerns due to the flammability of the liquid electrolyte. Solid polymer electrolytes (SPEs) can bypass this obstacle and therefore represent a serious alternative to conventional electrolytes. Especially single-ion conducting polymers (SICPs), which have the anion covalently bonded to the backbone of the polymer and thus exhibit a theoretical transference number of unity, are of great interest in battery research. This property is especially interesting for lithium metal batteries due to the ability of supressing dendritic growth. In addition to that, these polymers show reasonable high ionic conductivities, what makes commercialization possible. Here, the SICP Poly((trifluoromethane)sulfonimide lithium styrene) (PSTFSILi) with Lithium bis(trifluoromethanesulfonyl)imide (LiTFSI) is used as SPE and capillary battery cells are fabricated and tested. This special cell type allows the observation of the structural evolution of the polymer electrolyte during cycling of the battery with small/wide angle x-ray scattering (SAXS/WAXS).

Authors: APFELBECK, Fabian Alexander Christian (1 Technische Universität München, Fakultät für Physik, Lehrstuhl für Funktionelle Materialien, James-Franck-Str.1, 85748 Garching, Germany); Prof. MÜLLER-BUSCHBAUM , Peter (1 Technische Universität München, Fakultät für Physik, Lehrstuhl für Funktionelle Materialien, James-Franck--Str.1, 85748 Garching, Germany 2 Heinz Maier-Leibnitz-Zentrum (MLZ), Technische Universität München, Lichtenbergstr. 1, 85748 Garching, Germany)

Presenter: APFELBECK, Fabian Alexander Christian (1 Technische Universität München, Fakultät für Physik, Lehrstuhl für Funktionelle Materialien, James-Franck-Str.1, 85748 Garching, Germany)

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