Impact of Polymer Interlayers on All-Solid-State Battery Performance Using a Physicochemical Modeling Approach

In this work, The p2D model is extended to account for Li-ion transport in the solid-polymer-electrolyte (SPE) interlayer and in the ceramic LLZO solid electrolyte, as well as for the charge transfer at the SPE|LLZO interface using Butler-Volmer-like kinetics.

- Extension of p2D model to account for charge transfer kinetic at SPE|LLZO interface.
- Overpotential analysis revealed a significant polarization from SPE|LLZO charge transfer.
- Implementation of variance-based global sensitivity studies to disclose the impact of polymer-related parameters.
- Optimized SPE|LLZO charge transfer kinetics reduces polarization losses exponentially.
- Optimizing SPE|LLZO charge transfer boosts accessible capacity in ASSBs by 20% at 2C discharge.