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Mapping and Modeling Electromechanical Heterogeneity in Solid-State Batteries

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Our prior focus of interfacial electrochemical processes has been on homogeneous interfaces like solid-liquid. However, solid-state batteries present a new challenge: heterogeneous solid-solid interfaces under mechanical constraints. In this talk, I will discuss the development of ultrafast XCT, photoacoustic microscopy, and confocal Raman spectroscopy, to directly visualize the dynamic evolution of physicochemical fields in solid-state batteries. I will also introduce an electrode-adaptive heterogeneous solid-state battery modeling strategy, Real 2D (R2D). These lead to innovative ways to manage and control heterogeneity, thus improving the electrochemical performance of solid-state batteries.