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Measuring interfacial diffusion of $^{8}Li^{+}$ in solid-state battery materials with β-NMR

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Solid-state batteries (SSBs) are considered as a promising solution to address the safety issues and energy density limitations of conventional liquid batteries[1,2]. Although there have been significant breakthroughs in SSB technology in recent years, several challenges still need to be addressed before they reach the commercial market. A key challenge is their slow charge and discharge rates, which arises from poor ion diffusion and conductivity at the interfaces[3,4]. Unfortunately, many standard techniques to study these materials are limited to the bulk, making interface optimization difficult[5–7]. β-NMR, however, offers spatial precision for probing ion transport[8–10]. Using β-NMR relaxometry as a function of temperature, we aim to compare $^{8}Li^{+}$ diffusion in the bulk and anode-electrolyte interface. These experiments, using electrolytes with varying Cl and S content (argyrodites Li_7PS_6, Li_7PS_6Cl, and $Li_{5.5}PS_{4.5}Cl_{1.5}$), will help determine the role of these anions in interfacial conductivity.

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