Phase Domain Wall Mechanism of Ion Conduction

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I will present results recently obtained by Bragg Coherent Diffraction Imaging (BCDI) on solid-state electrolyte (SSE) materials. BCDI is highly sensitive to phase shifts within crystalline materials. This allows us to detect the presence of phase domains within materials that are virtually invisible to other techniques. We find that NASICON family SSEs have a distinct pattern of phase domains, 50-100 nm in size, with sharp domain walls between them. It is proposed that these domain walls can contribute to the ion conduction mechanism and that this is a plausible mechanism for the strong enhancement in conductivity [1] of high-entropy formulations of SSE materials.

[1] Y. Zeng, B. Ouyang, J. Liu, Y-W. Byeon, Z. Cai, L. J. Miara, Y. Wang and G. Ceder, High-entropy mechanism to boost ionic conductivity, Science 378 1320–1324 (2022)