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Operando study on structure-activity relationship between electrolyte components and electrochemical performance for all-solid-state lithium-ion batteries

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All-solid-state lithium-ion batteries (ASSLIBs) have received extensive attention as one of the most promising power sources for flexible and wearable electronics, mainly because of their high flexibility, high energy density and reliable safety. However, the practical application of ASSLBs has been hindered by the poor interfacial stability and inferior ionic conductivity. Solid polymer electrolytes (SPEs) exhibit great potential in developing solid-state batteries, specifically for PEO and PEO-based derivatives, because of their superior interfacial compatibility, outstanding solubility against lithium salts, wide electrochemical windows and high ionic conductivity. At the same time, solid fillers, as an important component in SPEs, play a crucial role in determining the overall electrochemical properties. Several strategies have been adopted to address the above issues, nevertheless, the SPEs degradation mechanism is still not clear and needs to be further studied. As a consequence, we start from PEO-based materials and prepare SPEs by adding plastic additives and solid fillers with good structure. The structure-activity relationship between the component structure of the electrolyte and the electrochemical performance is elucidated by a combination of electrochemical characterization and morphological structural characterization.

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