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Lithium-ion containing block copolymer electrolytes for rechargeable lithium batteries

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Current rechargeable Li-ion batteries are important constituents of portable electronics, stationary grid-energy storage components, and hybrid/electric vehicles. Solid-state polymer electrolytes (SPEs) is one of the most promising candidates for replacing conventional liquid electrolytes, ensuring better safety, higher theoretical storage capacity and longer calendar and cycle life. However, most solid-state polymer electrolytes exhibit lower ionic conductivity at room temperature, this is where this study coming from.
In this study, diblock copolymer (PS-b-PEO), lithium salt (LiTf) and ionic liquid (EMIMTf) are used to composite SPEs, LiFePO4 serves as the active material for the cathode, lithium metal is employed as the anode. In the previous study taken by our group, the relationships between the conductivity performance and the morphology of the ternary hybrid solid-state polymer electrolytes, as well as the crystalline nature of this doped PS-b-PE have been investigated by employing SAXS/WAXS, DSC and impedance measurements for different temperatures and ionic liquid ratios. Whereas the lithium-salt concentration was kept constant at a molecular ratio of [Li]/[EO] = 0.1. The highest ionic conductivity value of 1.710−3 S/cm at room temperature was found with a ratio of [IL]/[EO] = 0.3, which is very competitive with other systems like high ionic conductivity gel-like electrolytes. Complete Li/SPE/LiFeO4 batteries were then assembled in an argon glovebox as my work. Hereafter, DC electrochemical measurements were performed, wherein, current, voltage, capacity, and energy were collected.
The follow up works include optimising the hand made full cell to achieve a more stable cycling performance, from where the in situ SAXS/WAXS can be carried out for the investigation of the morphology changing during cells charging and discharging.

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