Solid ion conductors and their applications

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Abstract: Solid-state battery changes format of current battery by replacing highly flammable liquid organic electrolyte by a solid ionic conductor. This type of Li-ion conductor has not only been used for solid-state batteries but also Li-air batteries, aqueous batteries, and flow batteries. The key to success to use solid ionic conductors as electrolyte is ionic conductivity. However, most of current oxide-based solid ionic conductors possess about one to two orders of magnitude lower than those of liquid electrolytes. Therefore, increase in ionic conductivity is important. Moreover, Li ion transportation in current battery is through liquid-solid interface whereas the format of solid-state battery requires Li ions to transport through solid-solid interface, leading to large increase in the interface impedance. We at National University of Singapore and National University of Singapore Suzhou Research Institute have developed various type of solid electrolyte which have been used in Li-air battery and all-solid-state battery that can be operated at room temperature of 25^{o}C. This presentation will provide an overview of current state of Li ion conductors and solid-state batteries.

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