

Instinct Solid Polymer Electrolytes for Lithium Batteries

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Rechargeable lithium batteries with all-solid-state polymer electrolyte are expected to play a key role in the development of portable electronics as well as electric vehicles. Compared with liquid electrolytes, polymer electrolytes are attractive alternatives because of several important issues, such as mechanical properties, easier fabrication, and safety. For the dry system, the salt is dissolved in the polymer frame work as is the case in the familiar poly(ethylene oxide) (PEO) membrane. Good quality, mechanically strong PEO-films could be obtained but unfortunately, in most cases, the reported conductivity is quite low ($10^{-8} \sim 10^{-9} \text{ Scm}^{-1}$) at room temperature. It is caused by high crystallinity and low salt dissociation of PEO.

Succinonitrile (SN) was applied to PEO electrolytes to control the degree of crystallinity and its high polarity assists the salt dissociation in PEO. PEO-SN blend in equal weight fraction showed room temperature ionic conductivity of 10^{-8} Scm^{-1} with nearly two orders of magnitude higher than that of pure PEO system. In addition, PEO-salt complex resulted in highly improved ionic conductivity of $\sim 4 \times 10^{-4} \text{ Scm}^{-1}$ at 25 °C.