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Solid polymer electrolyte based on crosslinked polyrotaxane

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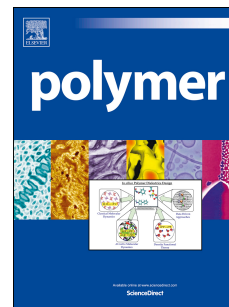
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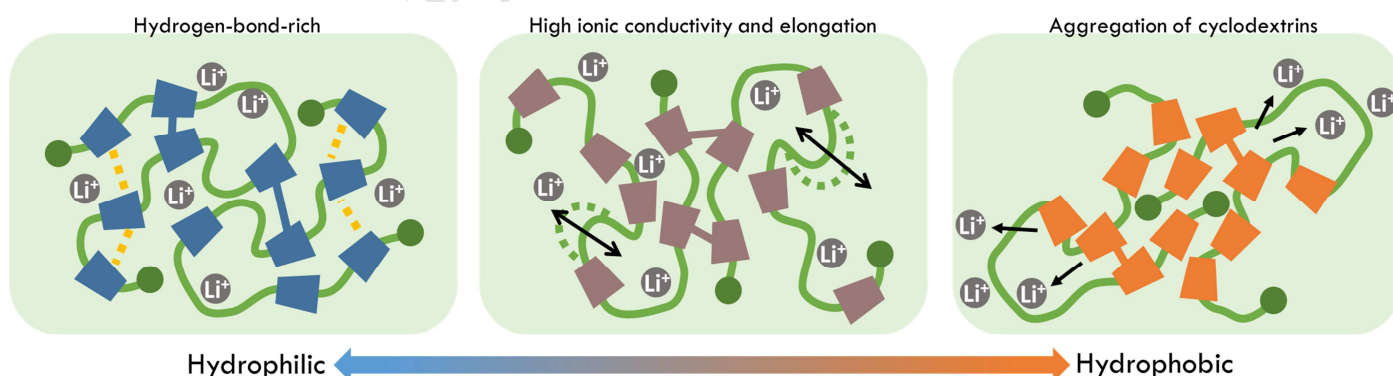
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[Abstract]

In this work, we introduce a new “mobile crosslink” concept for the fabrication of solid polymer electrolytes (SPEs) through the crosslinking of α -cyclodextrins (α -CDs) in a poly(ethylene glycol)-based (PEG-based) polyrotaxane. The PEG axis facilitates the conduction of lithium ions, while the crosslinked CDs that are not chemically bound to the PEG form mobile crosslinks that suppress the crystallization of PEG, maintaining its segmental mobility even after crosslinking. To weaken the strong hydrogen bonds between the abundant hydroxyl groups on the CDs, which restrict the segmental motion of PEG resulting in lower ionic conductivity, an appropriate amount of propyl isocyanate is added to effectively enhance the ionic conductivity and robustness of the SPE.

[Graphical abstract]



[Keywords]

Polyrotaxane, slide-ring material, solid polymer electrolyte

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