Interface Engineering for Solid-State Electrolyte in Lithium-Ion Batteries

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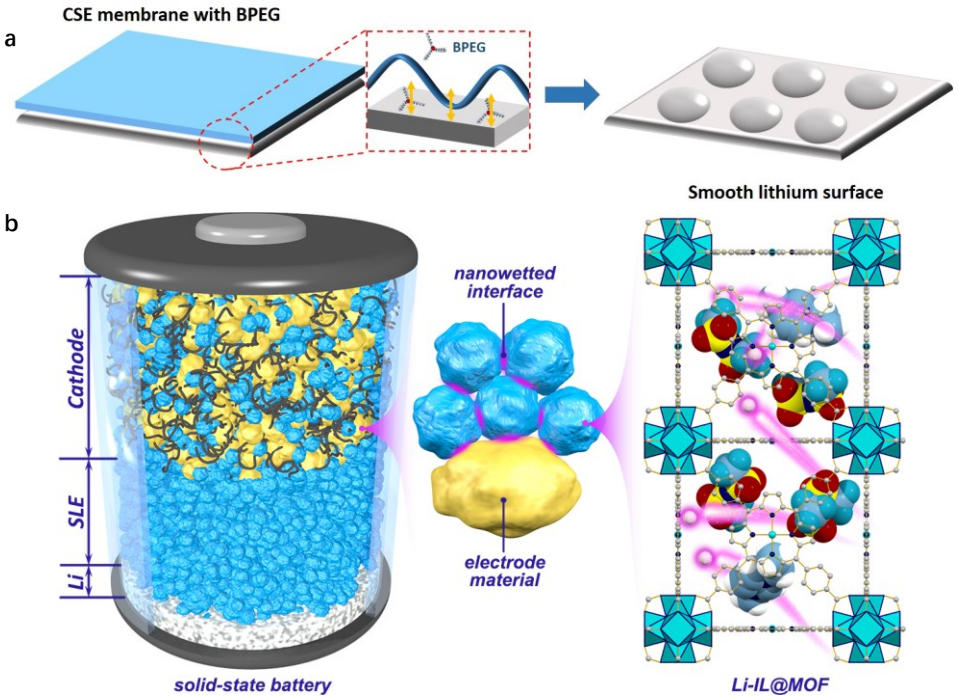
Herein, two approaches to promote the contact between solid-state electrolytes and lithium metal anodes are presented. First, a flexible composite solid electrolyte membrane consisting of inorganic solid particles, poly ethylene oxide (PEO) and boronized poly ethylene glycol (BPEG) was prepared and investigated.[1] The addition of planar BPEG oligomers not only disorganize the crystallinity of the PEO domain, leading to good ionic conductivity, but also facilitated a "soft contact" between interfaces, which not only chemically enabled homogeneous lithium plating/stripping on the lithium metal anode, but also reduced the polarization effects (shown in **Scheme 1a**).

Next, a novel solid-like electrolyte based on ionic liquid impregnated metal-organic framework nanocrystals (Li-IL@MOF) is also investigated, demonstrating excellent electrochemical properties, including a high room-temperature ionic conductivity of 3.0×10^{-4} $S \cdot cm^{-1}$.[2] The unique interfacial contact between the SLE and the active electrodes is attributed to an interfacial wettability effect of the nano-confined Li-IL guests, which creates an effective 3D Li^+ conductive network throughout the whole battery (shown in **Scheme 1b**).



Scheme 1. Schematic illustrations for (a) the effect of BPEG in Li plating; (b) nanowetted interfacial mechanism.

References:

[1] L. Yang, Z. Wang, Y. Feng, R. Tan, Y. Zuo, R. Gao, Y. Zhao, L. Han, Z. Wang, F. Pan, *Adv. Energy Mater.* **2017**, *7*, 1.

[2] Z. Wang, R. Tan, H. Wang, L. Yang, J. Hu, H. Chen, F. Pan, *Adv. Mater.* **2018**, *30*, 1.