Flexible Polymer Electrolyte for All-Solid State Lithium Batteries

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Rechargeable lithium ion batteries are now widely applied in the energy landscape. However, safety issues such as short-circuiting, thermal runaway and explosion hazards frequently occur, especially in the liquid electrolyte systems. Solid polymer electrolytes turn out to be an alternative strategy to overcome the above issues. However, the bottleneck constraining the application of the crystalline PEO for lithium batteries is its low ionic conductivity at ambient temperature. In order to solve this problem, we demonstrate a new type of amorphous PEO based electrolyte with high conductivity. By utilizing the “thiol-ene” click chemistry, the linear PEO can react with the 4SH cross-linking agent and results in an elastomer. After that, I investigated the electro-chemical properties of the two kinds of electrolyte. I found that the room temperature conductivity of the lithium ion battery with cross-linked PEO was nearly 100 times higher than that of the linear PEO. What's more, the fabricated cells exhibit good resistance to lithium dendrites' growth and ensure high cycling stability. The cycling time of the lithium battery with cross-linked PEO as electrolyte is more than 300 hours, which is much longer than that of the linear PEO.

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