Nanoporous Structure-Tuned Composite Separator Membranes for Lithium-Ion Batteries

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A separator membrane in a lithium-ion battery is considered a key component to secure battery safety, because its primary function is to keep physical isolation between a cathode and an anode of a battery so that no electrons can flow between them. In general, separator membranes are made mostly of polyolefins, usually polyethylene (PE) or polypropylene (PP). Although these polyolefin separator membranes have many advantages, their poor thermal stability and mechanical strength have raised serious concerns in maintaining the electrical isolation between electrodes. In this presentation, in an endeavor to breakthrough these limitations of polyolefin-based separators, we demonstrate new, nanoporous structure-tuned composite separator membranes. In comparison to commercialized PE separator membranes, the composite separator membranes offer excellence in thermal stability, liquid electrolyte wettability, ion transport, and interfacial stability with ! electrodes. These unique features of the composite separator membranes play a key role in providing the improved cell performances, particularly at harsh charge/discharge conditions.