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Hybrid silica membranes with a polymer nanofiber skeleton and their application as lithium-ion battery separators

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Abstract: Inorganic nanoparticles are frequently adopted to modify polymer porous membranes, aiming to fabricate high performance lithium-ion battery separators. However, the loading of inorganic nanoparticles is usually low, which limits their effects on the performance of modified polymer porous membranes. This study reports novel hybrid membranes with highly loaded silica nanoparticles of 67.5 wt% as a matrix. Good strength and flexibility of hybrid silica membranes are ensured by interpenetrated polymer nanofibers as a mechanical skeleton. The hybrid silica membranes have excellent dimensional stability at 200 °C, and high liquid electrolyte uptake and resultant ionic conductivity. The coin cells with hybrid silica membranes as separators show superior discharge capacity and cyclic performance even at a high temperature of 120 °C.

Keywords: hybrid composites; nanoparticles; electro-spinning

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