

Design and Synthesis of Guest-Host Nanostructures to Enhance Ionic Conductivity Across Nanocomposite Membranes

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Technology Summary

The subject invention disclosed herein is a nanomaterial design and a unique synthesis method for “guest-host” nanocomposite thin-layer membranes containing unique nanostructures, able to provide enhanced ionic conductivity flowing through candidate solid oxide electrolytes. . The conductivity-enhancing mechanism of the subject invention is fully achieved by 1) creation of nanocrystalline phases, 2) increased density and orientation of nanograin interfaces, and 3) nanoscale confinement of grain growth and nanograin alignment inside nanopore channels. This nanostructure of the subject invention potentially leads to a new way to develop practical membrane technology that enables super high conductivity. The subject invention allows grain-boundary engineering (interface density and orientation, impurity segregation), defect engineering (change of oxygen vacancy concentration), nanostructure tailoring (grain/pore size and alignment), and realization of nanophase stability (nanoscale confinement to restrict grain growth); all of which are critical to improve the properties of solid electrolytes.

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