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Molten Salt Synthesis of Doped Ceria-Na_2CO_3 Nanocomposites

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ABSTRACT

Solid oxide fuel cells (SOFCs) are considered as one of the most promising power generation technologies which convert the energy of chemical reactions directly into electrical energy and heat with high efficiency. Recently, ceria-based composite materials, especially ceria-carbonate composites, have been developed as competitive electrolyte candidates for intermediate temperature (600-800°C) operation of SOFCs. Composite electrolytes composed of Sm^{3+}, Gd^{3+}, Y^{3+} doped ceria and sodium carbonates (Na_2CO_3) were synthesized via a facile and environmental friendly molten salt method. Hydrated metal nitrates, sodium hydroxide and sodium carbonate are used as the raw materials. The proposed procedure consists of a mechanically induced metathesis reaction and short firing above the melting point of sodium nitrate. The purpose of mechanically induced metathesis reaction is to generate in situ $NaNO_3$ flux and to obtain a suitable precursor for the synthesis of target materials in molten nitrates. The prepared materials were then characterized by X-ray diffraction, thermal analysis, infra-red analysis, transmission electron microscopy, scanning electron microscopy, electrical properties etc.

Keywords: ceria nanocomposites, solid oxide fuel cells, solid electrolytes