

Synthesis and ionic conductivity of mechanically synthesized yttrium-doped ceria solid solutions

ABSTRACT

Doped ceria is considered the most promising high-conducting electrolyte, alternative to the commercially used yttria-stabilized zirconia. The ceria fluorite structure is very tolerant to dissolution of lower valent metal ions. The present employed mechanical method, introduces comparison of mechanical-synthesized yttrium-doped ceria system, denoted as $Ce_{1-x}Y_xO_{2-(0.05\text{--}0.4)}$, which were successfully synthesized by both conventional solid-state and mechanochemical methods. In mechanochemical reaction, fine-grained powders with uniform grain size distribution were obtained. X-ray diffraction analysis showed all solid solutions were single phase with cubic fluorite structure. The electrical conductivity of sintered samples of calcium doped ceria compounds were investigated in air as a function of temperature using AC impedance spectroscopy. Impedance data showed that yttrium-doped ceria electrolyte is a good ionic conductor with conductivity as high as 10^{-3} ohm cm^{-1} . Further characterization using Differential Thermal Analysis (DTA), Thermo Gravimetric Analysis (TGA) and Scanning Electron Microscopy (SEM) were carried out.

Keyword: Oxide ion conductor; Yttrium; Ceria