# Peculiar phase transformation behavior on Ionic Conductivity of CeO2 modified Y-ZrO2

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## Abstract

Ionic conductivity of CeO2 modified 3Y-ZrO2 evaluated through investigations of a phase transformation of the material system were conducted in the present work. Specimens of 3, 6, 9, 12 and 15mol % CeO2 doped 3Y-ZrO2 were prepared by an oxide mixing method and uniaxially cold pressed and sintered at 1500℃ for 1hour. The ionic conductivity was measured by the AC impedance spectroscopy with a temperature range from 300 to 800℃. Measurements on the grain size of sintered samples indicate that doping of CeO2 shows significant effects on grain growth of specimens. Ionic conductivity of CeO2 modified Y-ZrO2 was higher than that of a tetragonal zirconia polycrystal (3Y-TZP) and fully stabilized zirconia (FSZ) samples measured below 700℃. The curves of ionic conductivity versus reciprocal temperature show good agreement with the Arrhenius polts giving the activation energy of 15mol % CeO2 doped Y-ZrO2 specimens of 0.9eV and the activation energy of the specimen was lower than those of TZP and FSZ samples, with values of 1.05eV and 1.2eV, respectively. The results indicate that CeO2 doped 3Y-ZrO2 materials not only exhibit excellent ionic conductivity, but also possess outstanding mechanical properties. Conductivity as a function of temperature implies that a conductivity anomaly was observed, which is consistent with a phase transition revealed in a differential thermal analysis. The result indicates that the peculiar phase transformation presumably enhances conduction behavior at 430℃ in 6 mol % CeO2 modified Y-ZrO2. The relationship of ionic conductivity and the peculiar phase transformation has a significant potential to enhance ionic conductivity of the electrolytes in SOFC.