Ionic Conductivity of Gd- and Y-Doped Ceria-Zirconia Solid Solutions

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Dedicated to Professor Wolfgang Jeitschko on the occasion of his 70th birthday

The total conductivity of the solid solutions \((\text{Ce}_{1-x}\text{Zr}_{x})_{0.8}\text{Gd}_{0.2}\text{O}_{1.9}\) and \((\text{Ce}_{1-x}\text{Zr}_{x})_{0.8}\text{Y}_{0.2}\text{O}_{1.9}\) was measured in air as a function of temperature \((T = 300 \degree C - 600 \degree C)\) and composition \((x = 0.0 - 0.9)\). A deep minimum of the bulk ionic conductivity was found for equal fractions of ceria and zirconia. It indicates enhanced defect association and ordering of the oxygen vacancies around \(x = 0.5\). X-ray analysis (Guinier technique) showed the diffraction pattern of the cubic fluorite structure for all investigated compositions \(0 < x < 1\). The lattice parameter decreased linearly with increasing zirconia content \(x\).

Key words: Ceria, Zirconia, Lattice Parameter, Ionic Conductivity, Impedance