

Accession number:20114614524001

Title:Broadband spectroscopy of the complex conductivity of polycrystalline yttria-stabilized zirconia

Authors:Teranishi, Takashi (1); Hayashi, Hidetaka (1); Kishimoto, Akira (1); Tsurumi, Takaaki (2)

Author affiliation:(1) Graduate School of Natural Science and Technology, Okayama University, 3-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530, Japan; (2) Graduate School of Science and Engineering, Tokyo Institute of Technology, 2-12-1 Ookayama, Meguro, Tokyo 152-8552, Japan

Corresponding author:Teranishi, T.(terani-t@cc.okayama-u.ac.jp)

Source title:Materials Science and Engineering B: Solid-State Materials for Advanced Technology

Abbreviated source title:Mater Sci Eng B Solid State Adv Technol

Volume:177

Issue:1

Issue date:January 25, 2012

Publication year:2012

Pages:69-73

Language:English

ISSN:09215107

CODEN:MSBTEK

Document type:Journal article (JA)

Publisher:Elsevier Ltd, Langford Lane, Kidlington, Oxford, OX5 1GB, United Kingdom

Abstract:Broadband conductivity spectra from 100 to 10^{14} Hz (100 THz) were acquired for yttria-stabilized zirconia (10 mol% Y_2O_3 -doped ZrO_2 , 10YSZ) to quantify contributions from conduction due to the electrolyte-electrode interface, grain boundaries, universal dielectric response (UDR), and optical phonons. The UDR contribution governed the intrinsic conductivity at all frequencies except specific frequencies in the terahertz range, where phonon contributions governed conductivity for both ceramics and single crystals. UDR parameters σ_0 and σ_{dc} increased with increasing temperature, resulting in increased microwave conductivity. The complex conductivity converged at frequencies of hundreds of gigahertz due to a decrease in the power-law constant, s , with increasing temperature. The optical phonon contribution to the total conductivity, due to an increase in the damping factor Γ of TO with increasing temperature, was small, while the phonon-mode frequency Ω of TO affected the microwave conductivity of 10YSZ.

Number of references:20