The Temperature Dependence of the Electrical Conductivity of ZrO_2-12 mol% Y_2O_3 Single-Crystal

Yutaka SUZUKI and Kohzo SUGIYAMA

(Department of Applied Chemistry, Faculty of Engineering, Nagoya University
Furo-cho, Chikusa-ku, Nagoya-shi 464)

The electrical resistivity of ZrO_2-12 mol % Y_2O_3 single-crystal was measured at temperatures from 700° to 1600°C, using the complex impedance method and d. c. four terminal method. Time dependence of the electrical resistivity appeared at temperatures below 900°C. The temperature dependence of the electrical conductivity was represented by the following equation :

$$\sigma=\frac{A}{T}\exp\left[\frac{-(\alpha+\beta T^{-1})}{kT}\right]$$

where A, α and β are constants, and k is Boltzmann constant. Constants obtained by the least squares method were $A=3.455\times10^4\Omega^{-1}\,cm^{-1}\,K$, $\alpha=1.864\times10^{-1}$ eV and $\beta=5.460\times10^2$ eVK, respectively. *[Received July 3, 1986 ; Accepted October 14, 1986]*

Photostriction in PLZT Ceramics

Toru SADA, Motoh INOUE* and Kenji UCHINO

(Department of Physics, Faculty of Science and Technology Sophia University
Kioi-cho, Chiyoda-ku, Tokyo 102
* Ube Research Laboratory, Ube Industries, Ltd.)

It is well known that ferroelectric (non-centrosymmetric) crystals are capable of revealing "bulk photovoltaic effect" i. e. production of greater-than-band-gap voltages under uniform illumination. While having piezoelectricity at the same time, the ferroelectrics are considered to cause the photostrictive effect as the superposition of these two phenomena. This paper describes the photovoltaic and photostrictive effects in the (Pb, La) (Zr, Ti)O_3 (PLZT) system. The composition PLZT (3/52/48) was found to reveal the largest product value of the photovoltaic voltage and piezoelectric coefficient. The photostriction and photovoltaic voltage are strongly dependent on the preparation method such as grain size and remanent polarization even with the same composition. Using PLZT ceramics, a photodriven relay has been fabricated and a primitive relay function controllable by the optical irradiation has been developed. *[Received August 12, 1986 ; Accepted October 14, 1986]*

Crack Growth Resistance Curve for a Short Bar Specimen of Sintered Silicon Nitride

Akira OKADA, Naoto HIROSAKI and Kazuo MATOBA

(Materials Research Laboratory, Central Engineering Laboratories, Nissan Motor Co., Ltd.
1, Natsushima-cho, Yokosuka-shi 237)

The R-curve evaluation was discussed for "Fractometer", and was applied to the short bar specimens of sintered silicon nitride. The values of K_R were increased slowly with crack extension. The K_R value of crack extension less than about 2 mm could not be determined, because of the "pop in" phenomenon prior to the initiation of the stable fracture. When the increment of the applied displacement was stopped, the load relaxation due to subcritical crack growth was observed. Thus, it is concluded that the measured K_R values are likely to be the K_I values of subcritical crack growth corresponding to the crack opening displacement rate of the specimens. *[Received July 23, 1986 ; Accepted October 14, 1986]*