

Pyroelectric and Piezoelectric Properties of Thick PZT –Films produced by a new Sol-Gel-Route

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Abstract

The pyroelectric and piezoelectric properties of thick PZT films processed via a new sol-gel method are being investigated. The films were deposited on gold coated alumina substrates. The pyroelectric properties are being evaluated using pyrodynamic measurements with either a laser or thermoelectric heat source. The pyroelectric coefficient is obtained from pyroelectric current measurements. The piezoelectric properties are being measured using a laser vibrometer-lock-in amplifier set-up. It is shown that the pyroelectric coefficient obtained with laser heating lies in the range of $108 \mu\text{C}/\text{m}^2\cdot\text{K}$, whereas heating from the rear of the specimen with the thermoelectric element lead to a value of in the range of $350 \mu\text{C}/\text{m}^2\cdot\text{K}$. These results are explained in terms through thickness temperature gradients. The piezoelectric displacement amplitude vs. applied voltage shows a no-linear behaviour which is explained in terms of Materials chemistry. The maximum effective piezoelectric coefficients, d_{33} , obtained is $340\text{pm}/\text{V}$, and is superior to the values known for ferroelectric thin films.