

The Fabrication and Dielectric Constant of (1-3) Piezoceramic Polymer Composites

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Piezoceramic-polymer composites having (1-3) type connectivity and of a scale size suitable for high frequency >1 MHz transducers was carried out in this study. The piezoceramics ($\text{PbZr}_{0.52}\text{Ti}_{0.48}\text{O}_3$, PZT) were prepared by the conventional mixed oxide route. The starting powders of PbO , ZrO_2 and TiO_2 were mixed and calcined at 800°C . The calcined powder was mixed with excess PbO and a lithium/bismuth-based glass forming in order to lower the sintering temperature to approximately 1000°C . A method for extruding rods of approximately $400\ \mu\text{m}$ diameter was developed. The rods were assembled and impregnated with epoxy resin to form 1-3 composites containing approximately 20 and 50 vol% piezoceramics. Both PZT rods and the composites were studied by a scanning electron microscope (SEM). The dielectric properties of the composites were measured. The equivalent capacitance model was employed to determine the dielectric for comparison.