

Electroelastic Fields Concentrations and Polarization Switching by Circular Electrodes in Piezoelectric Disk Composites

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The electroelastic fields concentrations due to circular electrodes at the interface of piezoelectric disk composites have been discussed through theoretical, numerical and experimental characterizations. This paper consists of two parts. In the first part, the problem of an internal electrode embedded at the interface of two dissimilar semi-infinite piezoelectric solids was formulated by means of Hankel transforms and the solution was solved exactly. In the second part, finite element analysis was carried out to study electroelastic fields in piezoelectric disk composites containing circular electrodes of different radii by introducing a model for polarization switching in local areas of fields concentrations. A nonlinear behavior induced by localized polarization switching was observed between the strain and the voltage applied to the electrode. Experiments were also conducted to study the strain state near the electrode tip in piezoelectric disks. Comparison of the predictions by the present model with experimental data is conducted.

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