EFFECT OF POLARIZATION ON FRACTURE TOUGHNESS
OF BaTiO$_3$/Al$_2$O$_3$ COMPOSITES

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Abstract

In this study, Al$_2$O$_3$ based composites dispersed with BaTiO$_3$ particles were fabricated by a conventional sintering process. The relative density and microstructure (grain size, phase) of composites were studied. The relative density of BaTiO$_3$/Al$_2$O$_3$ composites decreased with increasing BaTiO$_3$ content, and there were reaction phases between Al$_2$O$_3$ matrix and dispersed BaTiO$_3$ particles. The Indentation Fracture Method was used to evaluate the fracture toughness of the present composites before and after polarization. It was verified that an applied electric field induced distinct anisotropy in fracture toughness of BaTiO$_3$/Al$_2$O$_3$ composites between parallel and perpendicular directions to the poling direction. The fracture toughness was improved with addition of BaTiO$_3$ particles to Al$_2$O$_3$ matrix. The toughening mechanisms of BaTiO$_3$/Al$_2$O$_3$ composites have been also discussed.

Keywords: Al$_2$O$_3$; BaTiO$_3$; Composites; Ferroelectric properties; Fracture toughness; Piezoelectric properties; Polarization

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