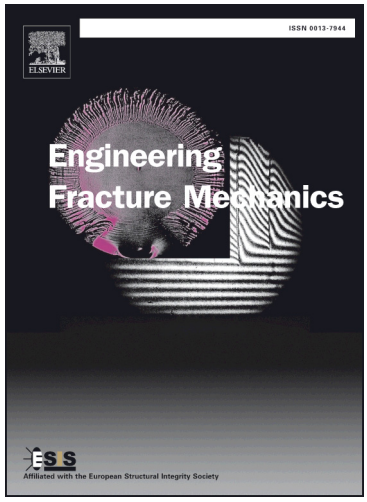

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Coupling effects of inertia and dual-phase-lag heat conduction on thermal shock fracture of a cracked piezoelectric layer

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Abstract: This paper studies the thermal shock fracture mechanics of a piezoelectric material thin layer with an internal crack. The typical model I and model II cracking problems are separately considered. The analyses are based on the dual-phase-lag, non-Fourier heat conduction theory with consideration of material inertia. Laplace transform and dual integral equation technique are applied to solve the problems. Some numerical results of the stress intensity factor and energy release rate are obtained and drawn in figures. It is demonstrated that the effect of the inertia on the fracture behavior depends on the ratio of the thermal wave speed to the stress wave velocity. In addition, the large ratio of the temperature gradient lag to the thermal flux lag will greatly enhance the mode I and mode II stress intensity factors.

Keywords: Piezoelectric materials, Fracture mechanics, Thermal shock, Dual-phase-lag heat conduction, inertia effect.

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