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Analysis of Thermoelastic Crack Problems Using Green–Lindsay Theory

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A boundary element method using the Laplace transform in time domain is presented for the analysis of fracture mechanics under thermal shock using the Green and Lindsay (GL) theory of thermoelasticity. The dynamic thermoelastic model of Green and Lindsay is selected to show the effect of thermal wave propagation at finite speed on crack tip stress intensity factor evaluation. The singular behavior of the temperature and displacement fields in the vicinity of the crack tip is modeled by the quarter-point elements. Thermal dynamic stress intensity factor for mode I is evaluated from computed nodal values, using the well-known displacement and traction formulas. The accuracy of the method is investigated through comparison of the results with the available data in literature. Condition where the inertia term plays important role is discussed and variations of dynamic stress intensity factor is investigated. Different relaxation times are chosen to briefly show their effects on stress intensity factor in the Green and Lindsay theory.

Keywords

- Dynamic crack problems,

- Thermal shock,
- Green-Lindsay theory,
- Boundary element method

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