Thermal shock fracture mechanics of a cracked solid based on the dual-phase-lag heat conduction theory considering inertia effect

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Abstract: This paper studies the effect of inertia on the thermal shock fracture mechanics of a cracked solid under the framework of dual-phase-lag heat conduction. Both heated crack and thermally insulated crack are considered, which develops the model I stress intensity factor and the model II stress intensity factor, respectively. It is found that the non-Fourier effect is significantly accentuated by the inertia effect. The inertia effect always enhances the amplitude of the model I thermal stress intensity factor for the heated crack. However, the inertia effect may weakens the amplitude of the model II thermal stress intensity factor for the thermally insulated crack if the thermal wave speed is high enough.

Keywords: Fracture mechanics, Thermal shock, Dual-phase-lag heat conduction, Inertia effect, Non-Fourier heat conduction.

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