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PROCEEDINGS

Elastic Bimaterial Interface Fracture Analysis by using Peridynamic Theory

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ABSTRACT

Interface fracture is the main failure mode of bonded materials and structures, its theoretical and numerical analysis have caused wide attentions. Peridynamics is a nonlocal meshfree method, which has a great advantage in materials and structures failure analysis. In our recent works [1-3], a general peridynamics-based framework for elastic bimaterial interface fracture problem analysis was established. The peridynamic interface model with the thermal effect was proposed, the nonlocal form of interface bond force was given. The energy release rate and mode mixity of the interface crack were computed with the peridynamic virtual crack closure technique (PD_VCCT). The extended critical energy density bond failure model was presented for the interface fracture prediction, in which the mixed-mode fracture was considered. The crack surface frictional contact behavior was modeled with the peridynamic node to node contact model. Some examples were analyzed with the proposed peridynamic model for verification and application, such as the single edge-notched bimaterial (SENB), asymmetric bimaterial cantilever beams (ABCB) and four-point shearing (FPS) tests. The interface deformation and fracture behaviors were captured with the peridynamic models. The results show that the proposed models achieve great success in bimaterial interface fracture analysis, with the comparison to the available analytical and the finite element method (FEM) solutions.

KEYWORDS

Bimaterial interface fracture; peridynamic theory; crack growth

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