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A dynamic model of bridging fiber pull-out of composite materials. (English) Zbl 1090.74018
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Summary: We carry out an elastic analysis of an internal central crack with bridging fibers parallel to the free surface in an infinite orthotropic anisotropic elastic plane. A dynamic model of bridging fiber pull-out is presented for analyzing the distributions of stress and displacement of composite materials with internal central crack under loading conditions (applied non-uniform stress and the traction forces on crack faces yielded by the fiber pull-out model). Thus the fiber failure is determined by maximum tensile stress, the fiber breaks, and hence the crack propagation should occur in self-similar fashion. By reducing the dynamic model to the Keldysh-Sedov mixed boundary value problem, a straightforward and easy analytical solution can be attained. When the crack extends, its fibers continue to break. Analytical study on the crack extension under the action of an inhomogeneous point force is performed for orthotropic anisotropic body; it can be utilized to attain the concrete solutions of the model by way of superposition.

MSC:

74E30 Composite and mixture properties
74R10 Brittle fracture
74G05 Explicit solutions of equilibrium problems in solid mechanics

Cited in **10** Documents

Keywords:

analytical solution; crack; Keldysh-Sedov mixed boundary value problem

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