

Fracture Toughness of Discrete Structure and Hierarchical Ramification

Structure

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Discrete structures and hierarchical ramification structures are often found in biological systems; the structures are generated naturally with simple rules and contribute to improvement of materials' strength. A cohesive zone model is adopted on the interfaces, and problems of crack propagation on the structured interfaces are analyzed by using FEM. First, we show that the fracture toughness depends on the discrete microstructure of the interface and discuss a discrete trapping effect. Secondly, cracking process on the interface of the hierarchical ramification structure is analyzed. The redundancy of the structure yields many variations of microscopic debonding patterns. During the cracking process, strain energy is partly released and stress distribution is accommodated. Since fracture process zone is spread widely, fracture toughness increases consequently.

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