

A novel test specimen for mixed mode I/II/III fracture study in brittle materials

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Abstract

A new test specimen is proposed for investigation of mixed mode I/II/III fracture of materials. In the test specimen, by displacing the position of an inclined crack from the middle of the rectangular specimen, in addition to mode II loading, mixed mode I/III loading conditions are created under anti-symmetric four-point bending. To examine the applicability of the test set-up, the specimens made of PMMA (Polymethyl-methacrylate) with three crack angles and three different positions of crack with reference to the middle of the specimen are tested. The experimental fracture loads are compared with the theoretical predictions of the maximum principal stress fracture criterion. There is a satisfactory consistency between the test and theoretical results. Although the proposed test configuration has limitations in applying the mixed modes of I/III and II/III, it is an efficient test configuration easier and less expensive than other configurations utilizing complex crack geometry or complicated loading fixtures.

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