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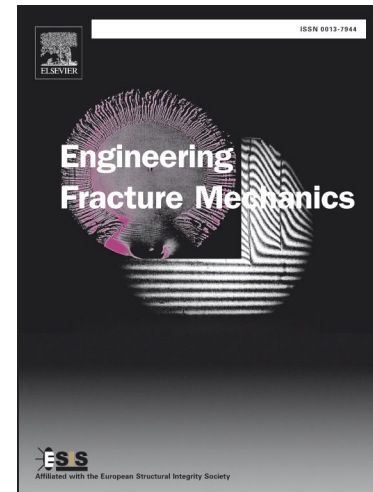
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Design of four-point SENB specimens with stable crack growth

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Abstract

A four-point single-edge-notch-beam (SENB) test specimen loaded in displacement control (fixed grip) is proposed for studying crack deflection at bi-material interfaces. In order to ensure stable crack growth, a novel analytical model of the four-point SENB specimen in fixed grip is derived and compared with numerical models. Model results show that the specimen should be short and thick, and the start-crack length should be deep for the crack to propagate stable towards the bi-material interface. Observations from experimental tests of four-point SENB specimens with different start-crack lengths, confirmed that the crack grows stable if the start-crack length is deep and unstable if not.

Keywords: Stable crack growth, Bonded joints, Brittle fracture, Adhesive, Finite element analysis

Nomenclature

a	actual crack length
a_0	start-crack length
A	area of cracked surface
b	adhesive layer thickness/beam thickness
B	horizontal distance between load- and support point
c	substrate thickness
C	compliance of beam
D	length of debond crack at interface
E_1, E_2	Young's modulus (substrate, adhesive)
\bar{E}	plane strain Young's modulus

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