Measurement of cohesive laws from mixed bending-tension tests

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The mixed bending-tension (MBT) test was proposed by Macedo *et al.* [1] to assess the mode I interlaminar fracture toughness of composite laminates with very low bending stiffness and strength. Specimens obtained from such laminates may fail in bending prior to delamination growth, when tested using the double cantilever beam test [2]. In the MBT test, the specimen with a pre-implanted delamination is adhesively bonded to two metal bars and then loaded in opening mode (Fig. 1).

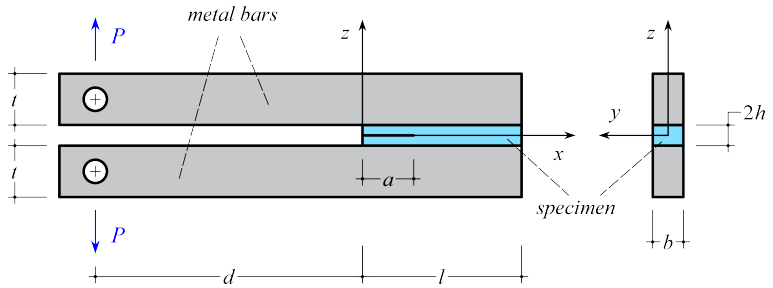

Figure 1: Scheme of the MBT test: (a) side view; (b) cross section.

Bennati *et al.* [3] developed a mechanical model of the MBT test, where the two separating parts of the specimen are connected by a cohesive interface with bilinear traction-separation law. Accordingly, the specimen response can be subdivided into three stages: (i) linearly elastic behaviour, (ii) progressive material damage, and (iii) crack propagation. The theoretical predictions were in good agreement with the experimental results by Macedo *et al.* [1] in the linearly elastic stage. Instead, only qualitative agreement was obtained for the subsequent stages.

Here, we upgrade the previous model by introducing a piece-wise linear, discontinuous traction-separation law for the cohesive zone [4]. We show how the global response of the specimen depends on the cohesive law parameters. Besides, we present an operative procedure to determine the cohesive law parameters based on the test measures.

References

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