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# Delamination Analysis in Composite Laminates by means of Acoustic Emission and Bi-linear/Tri-linear Cohesive Zone Modeling

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## Abstract

The Structural integrity of composite structures depends on the use of appropriate damage detection and structural health monitoring methods in design and operation stages. In this paper, the initiation and propagation of delamination in laminated composite materials are investigated by performing Double Cantilever Beams (DCBs) tests. Acoustic Emissions (AEs) are used to characterize the delamination crack tip during DCB tests. For this purpose, a combination of AE signal localizations and scattering reduction procedure is implemented to determine the delamination tip position. Besides, bi-linear and tri-linear Cohesive Zone Models (CZMs) are implemented to investigate the initiation and propagation of delamination. The results show that the tri-linear CZM can accurately determine both the initiation and propagation of delamination in the existence of fiber bridging while bi-linear CZM fails to do so. It is also found that AE is a powerful approach in determining the position of the delamination crack tip.

**Keywords:** Delamination; Acoustic Emission; Cohesive Zone Modeling; Laminated Composite.

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