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Predicting Interfacial Failure in Laminate Composite by using the Finite Element Method (FEM) : A Cohesive Zone Modeling Approach for Delamination

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Abstract **–** This study explores the interfacial failure modes of laminate composite, focusing on delamination and debonding. To simulate these failures, a cohesive zone model (CZM) is employed, with a key component being the traction-separation law that characterizes softening near the delamination tip. The study demonstrates the modeling of debonding using the COMSOL® 5.6 software based on the Finite Element Method (FEM) decohesion model. The CZM's effectiveness in predicting mixed-mode softening and delamination propagation is showcased through a model of mixed-mode bending in a composite beam. By subjecting the beam to various loading conditions, the CZM accurately predicts softening behavior and delamination progression. This research highlights the CZM's value in understanding and predicting interfacial failure, enabling improved design and structural integrity of laminate structures.

Keywords – Interfacial failure, Finite Element Method, laminate composite, cohesive zone model (CZM).