

Characterization of debond fracture resistance in sandwich composites

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Abstract

Lightweight sandwich composites are extensively used in structural applications. In the aeronautical and marine sectors, sandwich structures consisting of FRP skins and foam or honeycomb cores, are widely employed in primary components, such as bulkheads, rear and tail sections and fuselage or hull side shells of airplane and helicopters. However, despite the significant technological advances in this field, only recently (in December 2025), the first Standard for the characterization of resistance to mode I dominant face sheet-to-core fracture in sandwich constructions (ASTM D8637/D8637M-25) has been published. In this talk we will discuss current efforts toward standardization, with particular emphasis on the theoretical framework supporting the recently published test method for mode I dominant fracture. We will also address ongoing studies aimed at characterizing fracture toughness under mixed mode conditions. The role of crack tip root rotations in the derivation of accurate expressions for the energy release rate and the mode mixity conditions will be discussed, highlighting the necessity of rigorous two-dimensional elasticity formulations. Massabò, R., "The Effective Crack Extension and its Implications on the Single Cantilever Beam Test for Sandwich Composites," *Journal of Sandwich Structures & Materials*, 26(2), 2024, pp. 175-204, <https://doi.org/10.1177/10996362231174553>. Massabò, R., Upper and Lower Bounds for the Parameters of One-Dimensional Theories for Sandwich Fracture Specimens, 88(3), 031014, 2021, *Journal of Applied Mechanics*, <https://doi.org/10.1115/1.4049141>. Massabò, R. "Modeling delamination and kinking in sandwich specimens",

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https://icss14.unige.it/sites/icss14.unige.it/files/2025-07/ICSS-14_Book%20of%20Abstracts_finale_0.pdf

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