

عنوان مقاله:

Finite Element Analysis of Mechanical Properties of Basalt-Carbon Epoxy Hybrid Laminates

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خلاصه مقاله:

Hybrid laminates have been utilized in vast applications, namely aircraft, automotive, and other areas of light weight and high strength requirement. There are various types of hybrid laminates and an assessment of these laminates for their application is necessary. Experimental testing as per ASTM is expensive since it is destructive testing. In addition, the hybridization of basalt, a promising fibre along with other fibres has shown better laminate properties. Basalt-carbon epoxy hybrid laminated composites are a comparably inexpensive and sustainable alternative to conventional carbon fibre epoxy composites. Thus, in this paper, the evaluation of the new and advanced basalt-carbon epoxy hybrid laminated composites under static loading was conducted using Finite Element Analysis. Mechanical properties of basalt-carbon epoxy hybrid laminated composites such as tensile and compression strength, flexure strength, interlaminar, and in-plane shear strength were evaluated through different static test simulations. Specimens having different stack-up sequences and fibre orientations were analysed for failure based on Tsai-Wu failure criteria using commercial finite element software ANSYS Composite Pre-Post (ACP) and ANSYS Mechanical. The outcome of this work shows that laminates with basalt fibres on the inner side and carbon fibres on the outer side provided a better alternative with around 90-98% equivalent strength to pure carbon laminates in various mechanical strength tests. In addition, the lay-up of specimen C_Y [0₂C/+45B/0B]S was found to be the optimal stacking arrangement. Using specimen C_Y as a substitute to pure carbon fibre laminate not only provides almost equivalent strength but also reduces the cost by up to 40%. The comparable strength property of specimen C_Y was due to the placement of 00 carbon fibre at the outer faces of the composite.

کلمات کلیدی:

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