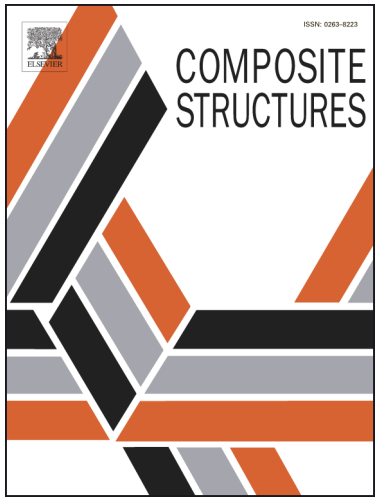

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Thermoplastic polyurethane/glass fabric composite laminates: low velocity impact behavior under extreme temperature conditions

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Abstract

This paper reports the low velocity impact behavior of thermoplastic laminated structures based on thermoplastic polyurethane reinforced with woven glass fiber highlighting effects related to sample thickness and test temperature with the aim to verify their potential applications. Plaques obtained by film stacking and compression molding technologies are tested using an instrumented falling dart machine at room temperature, -25 °C and -50 °C. Impact results are reported in terms of typical load-deflection and energy-time curves, but also discussed with reference to the well known ductility index (DI) parameter. As expected, the cooling is reflected in an increased stiffness of tested specimens and their higher propensity to the damage. Increases of plate thickness and reductions of the test temperature lead to enhanced friction phenomena at the material-dart contact, responsible of significant deviations from well established semi-empirical models about the Hertz contact force and the penetration energy.
Finally, no delamination phenomena seem to be verified for all investigated samples as supported by visual inspections of front and rear impacted areas.

Keywords: Thermoplastic polyurethane, glass fabric, composite laminate, low-velocity impact, extreme conditions

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