

Quasi-static crushing response of square hybrid carbon/aramid tube for automotive crash box application

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ABSTRACT

One of the essential automotive parts is a crash box, which is essential for initial kinetic energy absorption. However, both vehicle weight and energy-absorbing performance of crash box requirements have to achieve. Recently, crash boxes made of hybrid materials have increasingly studied regarding their better crash performance and weight reduction effects compared to conventional metallic materials. Therefore, the aim of this study is to fabricate a hybrid carbon/aramid composite crash box with a hollow structure and to determine its mechanical properties under quasi-static axial compressive and tensile loading. This study shows that square hybrid carbon/aramid tubes provide an average 57.94 J energy absorption, average 0.72 kJ/kg specific energy absorption, average 62.46 kN crushing peak load, average 748.40 MPa compressive modulus and average 36.29 MPa maximum stress under quasi-static compressive loading. It is suggested that a square hybrid carbon/aramid tube could have the promising potential to replace aluminium or metallic structure to use as an automotive crash box for lightweight applications.

KEYWORDS

Crash box application; Crushing response; Square hybrid carbon/aramid tube

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