Effect of winding angle on the quasi-static crushing behaviour of thin-walled carbon fibre-reinforced polymer tubes

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ABSTRACT

Carbon fibre-reinforced polymer (CFRP) tubes have been increasingly used in various structural applications due to its lightweight and attractive crashworthiness performance. The key parameter of the winding angle plays an important role in the energy-absorbing performance of CFRP tubes. In order to understand the relationship between the compressive performance and winding angle, this article is aimed to study the effect of winding angle with ±45°, ±60° and ±75° of CFRP tubes. The thin-walled CFRP tubes were performed by the quasi-static compression test, which were fabricated using the wet winding technique. The result was concluded that as the winding angle increased, the compressive modulus showed the decreasing trend. In the view of energy absorption (EA) and specific energy absorption (SEA), it was exhibited the decreasing trend as the winding angle increased. It was noted that CFRP tubes with ±45° winding angle recorded the average maximum SEA of 24.67 kJ kg^{-1}. Moreover, the crushing behaviour of thin-walled CFRP tubes were involved and studied.

KEYWORDS

Carbon fibre-reinforced polymer; CFRP tube; Winding angle; Filament winding technique; Crushing behaviour

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