Abstract

The axial compression loading and damage of four-step 3D circular braided composite tubes are reported in this paper by both experimental and finite element method approaches. In the axial compression experiment, the damage of the braided composite tubes was observed and the compressive load–displacement curves were acquired to analyze the compressive behaviors. In finite element analyses, three forms of repeating unit cell model were identified and used to describe the microstructure of the 3D circular braided composite tubes. The critical damage area and maximum stress theory was used as the failure criteria. From the study, it was found that the braiding parameters have a significant influence on the compression behaviors of the 3D braided composite tubes. There was a good agreement between the finite element and the experimental results. The inner and outer cells played a huge part and should be considered when calculating the overall mechanical properties of the 3D braided composite tube sample. The damage morphology was also compared and showed a good comparison between the experimental and finite element method.