

Abstract

The transverse impact deformation and damage of 3-D circular braided composite tubes were studied both in experimental and numerical approaches. A meso-structure geometrical model based on the braided architecture was established to analyze the impact damage and morphology. The transverse impact tests were conducted on a modified split Hopkinson pressure bar (SHPB) apparatus driven with high pressure Nitrogen gas under different pressures. The load-time histories and deformations of the 3-D circular braided composite tubes under transverse impact were obtained from experimental and compared with those in finite element analysis (FEA). The FEA results show satisfactory agreements with experimental data and demonstrate the validity of the model. Based on the finite element results, the deformation process and stress propagation were obtained to analyze the failure mechanism. The stress distribution on the composite tubes showed that the 3-D circular braided reinforcement was the main load-carrying component and absorbed most of the impact energy. The impact region was dented along the impact direction and a clear shear band was found around the impacted region.