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Author: Prof.Dr. Aleksandr Cherniaev
University of Windsor, Canada, aleksandr.cherniaev@uwindsor.ca

HIGH-FIDELITY MODELING OF ORBITAL DEBRIS IMPACT ON OPEN CELL FOAM CORE SANDWICH PANELS

Abstract

Sandwich panels are widely used in the design of unmanned satellites and in addition to having a structural function, can often serve as orbital debris shielding. In this application, sandwich panels with open-cell foam cores have a significant advantage, enabling intensive interaction between the impactor fragments and the foam ligaments which enhances the fragments' breakdown and reduces their damaging potential. Modelling of this process requires an explicit meso-scale representation of the core material. In this study, realistic geometry models were obtained for 10 pores per inch (ppi) and 20 ppi aluminum open-cell foams using X-ray Computed Tomography imaging. They were then converted into meshless simulation models and used in modelling of 6.9 km/s orbital debris impact on foam core sandwich panels. Results of the numerical simulations were compared with experimental data reported by NASA in terms of the panels' core and rear facesheet damage.