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Characteristics of hypervelocity impact of micro-particles on multi-foils shield configurations

Sunil C Joshi and **Govind Gour**
Nanyang Technological University, Singapore

Numerical investigation is carried out to assess performance of multiple foils shield configurations against hypervelocity micro-particle impact. Micro particle material mainly consists of three materials, namely aluminum, float glass and steel. Further the shield configuration is modelled by aluminum in first bumper foil and Ti-6Al-4V in the second foil. The modeled impact scenario has consistent dimensions in every simulation with the micro-particle diameter, first foil thickness and second foil thickness measuring 47μm, 8μm, 15μm respectively. Numerical investigation of the shield configuration was performed using smooth particle hydrodynamic processor in AUTODYN hydrocodes and material modeling was accomplished using an equation of state with constitutive strength and cumulative damage model. The numerical results accurately depict the DC generation, kinematic and geometrical parameters of the DC, micro-particle condition, and standoff foil condition after the impact. Studies have shown that a two foil shield configuration is capable of restraining micro-particles with mechanical strength similar to float glass and aluminum. Additionally a 1-mm thick Ti-6Al-4V plate has to be added into the shield configuration at 5 mm distance from the second foil to resist the impact of rigid (steel) micro-particles.

Biography

Sunil C Joshi obtained his PhD from Monash University (Australia) and has been a faculty in School of Mechanical & Aerospace Engineering since 2000. His expertise lies in the domain of Aerospace Materials and Structures, especially advanced composites and novel material systems. He was a member of XSAT, Singapore's first in-house designed and developed micro-satellites, team, where he served as the team leader for thermal controls sub-system. Besides currently being an Assistant Chair for Graduate Studies, he also chairs School's Aerospace Engineering (AE) accreditation committee that prepares towards accreditation of the BEng (AE) programme.

mscjoshi@ntu.edu.sg

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