Investigation of High-velocity Impact Process of Honeycomb Material with

Meso-structure-based Simulation

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Structures embedded with honeycomb core are widely used in spacecraft for the shielding purpose to space debris. The meso-structure of honeycomb material influences the shielding capability much, but the direct meso-scale simulation of high-velocity impact process is still challenging for numerical methods. A meso-scale particle structure of honeycomb material is constructed, and the simulation of high-velocity impact processes is carried out with the meshfree material point method. It is found that the direct meso-scale simulation with material point method can be very efficient and effective owing to the high efficiency and the convenient treatment of contact conditions. The meso-scale particle model is validated with experimental results. And then the influences of impact velocity and the parameters of the honeycomb meso-structure are investigated to obtain empirical formulations.

Keywords: High-Velocity Impact, Honeycomb Structure, Meso-structure, Material Point Method, Channeling effect