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PROCEEDINGS

Study on Peridynamics Simulation Method of Anti-Penetration of Ceramic/Metal Composite Structures

Haoran Zhang[1], Lisheng Liu[2,*], Qiwen Liu[2] and Xin Lai[2]

[1] Department of Engineering Structure and Mechanics, Wuhan University of Technology, Wuhan, 430070, China

[2] Hubei Key Laboratory of Theory and Application of Advanced Materials Mechanics, Wuhan University of Technology, Wuhan, 430070, China

[*]Corresponding Author: Lisheng Liu. Email: liulish@whut.edu.cn

ABSTRACT

Ceramic metal composite structure with high hardness, high bending strength of ceramic materials as the front layer and materials with high tensile strength, high elongation as the backing layer, has excellent penetration resistance. The current numerical methods for studying the penetration resistance of ceramic/metal composite structures under ballistic impact still have many deficiencies. Peridynamics (PD) is a novel nonlocal theory that is well suited for simulations involving damage and fracture behavior. At present, the existing rate-dependent bond-based PD (BB-PD) constitutive model considering the rotation effect and the Johnson-Cook (JC) metal model based on non-ordinary state-based PD (SB-PD) have been proved to be able to simulate the dynamic mechanical behavior of ceramics and metals under shock loading, respectively. However, there is no research on the anti-penetration behavior of ceramic/metal composite structures under the theory of PD. This paper focuses on the anti-penetration simulation method of ceramic/metal composite structure, establishes a new contact algorithm suitable for PD, the anti-penetration simulation system of ceramic/metal composite structure under the framework of PD theory was realized, and the frontal impact experiment of the ceramic/metal composite structure was simulated and analyzed, and the crack propagation mode, damage change of the ceramic faceplate and metal backplate, as well as the crack initiation and propagation law under different impact speeds are compared with the experimental and other numerical simulation results, which verifies that the system model can effectively simulate the whole process of penetration.

KEYWORDS

Peridynamics; ceramic/metal composite structure; contact algorithm

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