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Atomistic Simulations on the Shock Response of Nanoscale He Bubble in Metal

Jianli Shao[1,2,*] and Weidong Wei[1]

[1] State Key Laboratory of Explosion Science and Technology, Beijing Institute of Technology, Beijing, 100081, China

[2] Explosion Protection and Emergency Disposal Technology Engineering Research Center of the Ministry of Education, Beijing, 100081, China

[*]Corresponding Author: Jianli Shao. Email: shao_jianli@bit.edu.cn

ABSTRACT

This report mainly introduces our recent research on the shock-induced collapse, migration and coalescence of He bubbles in metal based on atomistic simulations. The He bubble will be compressed to permanent deformation with the finite plastic collapse of metal. Under strong shock, the He bubble can be breakdown by the nano-jet of the metal, but it returns to a reduced sphere in the molten metal after long-time evolution, driven by the He-Al interface energy. Besides, the shock-induced migration of He bubble is revealed, which can be divided into shock acceleration and the following inertial motion. Moreover, two coalescence modes caused by ligament failure and interface deformation are simulated. The Frenkel's model is used to analyze the coalescence kinetics dominated by the interface deformation, and the smoothing of sharp neck observed in our simulations is discussed.

KEYWORDS

He bubble; collapse; migration; coalescence; shock, atomistic simulation

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