

PROCEEDINGS

Multiscale Plasticity-Fracture Coupled Model

Yinan Cui^{1,*}, Zhijie Li¹, Zhangtao Li¹, Zhanli Liu¹ and Zhuo Zhuang¹

¹Applied Mechanics Lab., School of Aerospace Engineering, Tsinghua University, Beijing, 100084, China

*Corresponding Author: Yinan Cui. Email: cyn@mail.tsinghua.edu.cn

ABSTRACT

How the plasticity features influence the fracture behaviours of material is a critical question but remains far from well understood. To disclose this mystery, a multiscale plasticity-fracture coupled model is developed, which considers the atomistic-scale dislocation motion mechanism, the mesoscopic scales of discrete crack-dislocation interactions, and the continuum scale of crystalline plastic-fracture response. Body center cubic (bcc) material is chosen as an example to demonstrate the effectiveness of the developed model due to their wide applications and their special plasticity features, such as strong temperature dependence and non-Schmid effect. Several new insights about the fracture behaviour of bcc material are gained.

Funding Statement: The authors received no specific funding for this study.

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.



This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.