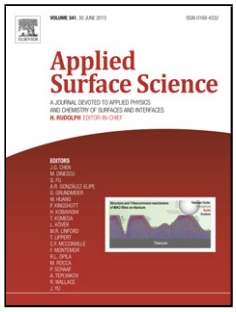

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Authors: Kun Zhang, Zheng Hu, Ziqiang Zhao, Bingchen Wei, Yansen Li, Yuhang Wei

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Whiskers Growth and Self-healing in Ti-based Metallic Glasses during Ion Irradiation

Kun Zhang[1], Zheng Hu[2], Ziqiang Zhao[3], Bingchen Wei[1,*], Yansen Li[1], Yuhang Wei[1]

[1]Key Laboratory of Microgravity (National Microgravity Laboratory), Institute of Mechanics, Chinese Academy of Sciences, Beijing 100190, China

[2]Science and Technology on Vehicle Transmission Laboratory, China North Vehicle Research Institute, Beijing 100072, China

[3]School of Physics, Peking University, Beijing 100871, China

Email: weibc@imech.ac.cn

Highlights

In this paper, Ti-based metallic glasses were subjected to a 20 MeV Cl^{4+} ion radiation under liquid-nitrogen cooling. Their responses, as well as effects of the electronic excitation and nucleus-nucleus collision were evaluated. The collision cascade during irradiation typically changes the structure by increasing the liquid-like zone, or the content of the free volume. However, along the ion incident depth, the structure change is inhomogeneous. Numerous whiskers appear and aggregate on the side of the irradiation surface, which are several micrometers away from the edge. This corresponds with the maximum collision depth obtained by the Monte Carlo simulation, where nuclear loss plays a dominant role. Moreover, the liquid-like zone continually forms, which add to the whiskers growth and subsequent self-healing. Results suggest that the irradiation-induced local shear stress combines with the well-localized liquid-like zone results in the observed phenomena. This study demonstrates that metallic glasses have high morphological instability under ion irradiation, which assets can pave new paths for their applications. We strongly believe the contribution of this study warrants its publication in the "Applied Surface Science".