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Ang Qiao,[1] Haizheng Tao,[1] Yueru Zhang,[1] Yuanzheng Yue[1,2]

[1] *State Key Laboratory of Silicate Materials for Architectures, Wuhan University of Technology, Wuhan 430070, China*

[2] *Department of Chemistry and Bioscience, Aalborg University, DK-9220 Aalborg, Denmark*

*Corresponding author. E-mail: qiaoang@whut.edu.cn

The melt-quenched metal-organic framework (MQ-MOF) glasses are a new family of glasses [1-3]. For potential applications and optimum design of such glasses, it is important to characterize and investigate their physical and chemical properties. However, these properties have, so far, not been documented in literature. In this work, we focus on studying the indentation behavior and hardness of MQ-MOF glasses by taking ZIF-62 as an example. Its chemical formula is $Zn(Im)_{1.75}(bIm)_{0.25}$, where Im and bIm represent imidazole and benzimidazole, respectively. We measure the Vickers hardness of a series of ZIF-62 glasses with varying bIm content. The results show that the Vickers hardness of the ZIF-62 glasses increases linearly with an increase of bIm. The origin of this linear trend is discussed in terms of structural evolution. We also reveal the deformation mechanism in ZIF-62 glasses during indentation by performing annealing experiments and atomic force microscopy measurements. The change of the ratio between densification and plastic deformation is determined to find out which of the two is the governing factor for the composition dependence of hardness. In summary, this work provides useful information for tailoring the mechanical properties of MQ-MOF glasses.

References:

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