Atomic structure and glass forming ability of Cu46Zr46Al8 bulk metallic glass

X. D. Wang,1 Q. K. Jiang,1 Q. P. Cao,1 J. Bednarcik,2 H. Franz,2 and J. Z. Jiang1

1 International Center for New-Structured Materials (ICNSM), Zhejiang University and Laboratory of New-Structured Materials, Department of Materials Science and Engineering, Zhejiang University, Hangzhou 310027, China
2 HASYLAB am DESY, Notkestrasse 85, D-22603 Hamburg, Germany

By using a combination of state-of-the-art experimental and computational methods, the high glass forming ability (GFA) of Cu46Zr46Al8 alloy is studied from the view of its atomic packing. Three-dimensional atomic configuration is well established. It is found that Al atoms almost homogeneously distribute around Cu and Zr atoms without segregation, causing the local environment around Cu and Zr atoms in Cu46Zr46Al8 bulk metallic glass different from that of the major competing phase of Cu10Zr7. Furthermore, the addition of Al not only increases the amount of icosahedronlike clusters but also makes them more homogeneous distribution, which can enhance the GFA by increasing the structural incompatibility with the competing crystalline phases.

References