Atomic-level mechanism of elastic deformation in the Zr-Cu metallic glass

To explore the microscopic response of a metallic glass (MG) to an applied hydrostatic load we performed a high-pressure extended x-ray absorption fine structure (EXAFS) study of the Zr66.7Cu33.3 amorphous alloy. EXAFS fitting revealed that on compression, Zr-Zr pairs are strained preferentially. Strong Zr-Cu interactions contribute to the stiffness of dominant Cu-centered clusters and the overall compressibility of the MG is mostly determined by the softer bonds between the Zr atoms belonging to the clusters' outer shell. Stress accommodation is accompanied by a variation of bonding preferences, which is consistent with the observed hierarchy of elastic constants of different atomic pairs.

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