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Understanding intrinsic ductility from Poisson's ratio for amorphous solids through force-field tuning YUNFENG SHI, JIAN LUO, Rensselaer Polytechnic Institute — This work is motivated by recently observed empirical relationship between the Poisson's ratio and the fracture energy for a range of metallic glasses and oxide glasses. Glassy solids with low Poisson's ratio are brittle and vice versa, with a critical Poisson's ratio of about 0.31. Here we used a force-field tuning scheme to investigate how a near-equilibrium elastic constant determines far-from-equilibrium fracture behavior. By modifying a well-studied binary Lennard-Jones system, we obtained a family of glassy systems with different Poisson's ratio ranging from 0.2 to 0.4. Interestingly, the model glasses with low Poisson's ratio exhibit brittle fracture in tension and vice versa, which agrees with experimental observations. Finally, we will discuss how ductility of amorphous solids can be comprehended in terms of the structure and bonding of the amorphous solids, both of which also dictate the Poisson's ratio.

Yunfeng Shi
Rensselaer Polytechnic Institute

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