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Improving the Mechanical Properties of Glasses from the Bottom-Up

Invited Talk

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Improving the Mechanical Properties of Glasses from the Bottom-Up

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Abstract

Oxide glasses with improved damage and fracture resistance are critically needed. Traditionally, new glass compositions have been developed through time-consuming trial-and-error experimentation. In this talk, I will discuss the recent progress in designing oxide glass compositions with improved mechanical properties from the bottom-up. Such design is building on knowledge of the deformation mechanism of glasses under high local stress, and by appropriately tailoring microstructures, glass materials with improved resistance to crack initiation and growth can be discovered. To this end, tuning of the glass chemistry is crucial to control the structural and topological transformations that occur under stress to enable energy dissipation. I will also discuss the new insights from atomistic simulations combined with topological analysis tools to unravel such stress-driven structural changes.