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Cracking the Code: Using Data Analysis to Engineer Stronger and Tougher Glasses

Invited Talk

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Cracking the Code: Using Data Analysis to Engineer Stronger and Tougher Glasses

Glasses are non-equilibrium materials that exhibit a glass transition and have a disordered (non-crystalline) structure. Glass materials can therefore be found across a variety of chemical compositions, from oxides to metal-organic frameworks. They feature heterogeneity and exhibit varying degree of structural disorder on different length scales, which has profound consequences for their properties and enables many applications. However, as known by its users, glass still breaks. Traditionally, new glass compositions have been developed through time-consuming trial-and-error experimentation. In this talk, I will discuss how we attempt to decipher their structure-property relations to accelerate the discovery process. Our work in this area combines experimental and simulation data with topological data analysis and various machine learning methods. I will also highlight how we use this knowledge to design more fracture-resistant glasses.