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Invited Talk

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Correlating Structure with Mechanical Properties in Hybrid Glasses

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Abstract

Combining strength, toughness, and transparency in glass materials is a longstanding challenge in the field. To this end, we here explore the possibility to tune the micro- and nanoscale structures of glasses by combining organic and inorganic constituents. Such hybrids offer enormous chemical versatility due to their exchangeable building units, but correlations between glass structure and mechanical properties have not yet been well established. Specifically, we here discuss structure-property relations in two families of hybrid glasses. First, sol-gel hybrid glasses based on co-networks of organic and inorganic components with molecular-scale interactions and covalent links that make them indistinguishable at the nanoscale and beyond. Second, metal-organic framework glasses formed from inorganic nodes connected to organic ligands and exhibiting nanoscale porosity. In both glass families, proper tuning of mechanical properties is needed for enabling their applications within, e.g., cartilage regeneration and gas separation, respectively.