

The fragility of glassforming liquids: thermal vs athermal systems, and kinetic vs thermodynamic origins.

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Abstract:

We attempt a brief recapitulation of efforts to document and understand the phenomenology of glass-forming liquids and model systems that relate to the characteristic known as "liquid fragility". Formerly a problem primarily for technologists, and referred to using a different language, the fragility of liquids has more recently become a theoretical challenge, as experiments have revealed an increasingly rich collection of structural and phenomenological details and interconnections, computer simulation methods have made possible the visualization of events at the atomic level at least for short time processes, and novel imaging techniques are beginning to provide the same for longer time scales. We highlight relations between normal pressure fragility (both kinetic and thermodynamic) and the alternative isothermal or athermal ("volume") fragility that is of importance to many hard particle modelling, and colloid experimental, investigations. Some of the pitfalls in quantifying fragility, both in experiment and simulation, are discussed. Along the way, events that have been important to the field, and some of the insights and changes in our own ideas, are put in perspective.