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Direct visualization of particle scale internal stresses in a colloidal glass ITAI COHEN, NEIL LIN, MATT BIERBAUM, JAMES SETHNA, Department of Physics, Cornell University — Bullet proof windshields, smart phone screens, and Prince Ruperts drop are all examples of how internal stresses can dramatically affect the strength of glass. Imaging the way internal stresses are distributed and their evolution under an applied load remains prohibitively difficult. For example, work on disordered granular packs suggests that stress heterogeneity may extend down to the scale of a single particle. While resolving stresses at the single atom scale is not feasible, measurements of stresses at the single particle scale in colloidal glasses, a widely used model system for atomic glasses, can be achieved by using Stress Assessment from Local Structural Anisotropy (SALSA). This method relies solely on the particle configurations obtained via high speed confocal microscopy. Here, we use SALSA to visualize the three dimensional stress network in a colloidal glass. By placing the suspension under shear we determine the evolution of this network and how it alters the bulk mechanical behavior of the suspension. Our work constitutes a first step towards understanding how local variations in the stress networks of glasses can lead to the dramatic mechanical properties of tempered glass.

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