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Resolving structural modifications of colloidal glasses by combining x-ray scattering and rheology DMITRY DENISOV, TRIET DANG, University of Amsterdam, The Netherlands, BERND STRUTH, Deutsches Elektronen-Synchrotron, Hamburg, Germany, GERARD WEGDAM, PETER SCHALL, University of Amsterdam, The Netherlands — Glasses have liquid-like structure, but exhibit solid-like properties. A central question concerns the relation between the structure and mechanical properties of glasses, but structural changes remain difficult to resolve. We use a novel combination of rheology and x-ray scattering to resolve structural changes in colloidal glasses and link them directly to their mechanical behavior. By combining stress and structure factor measurements, we resolve shear induced changes in the nearest neighbor configuration as a function of applied stress, allowing us to elucidate the structural origin of the genuine shear banding transition of glasses. Our results reveal a coupling between structural parameters and the applied shear that underlies this instability: the non-monotonic behavior of the flow curve is directly mirrored in simple structural measures such as the position, the width, and the height of the nearest neighbor peak of the structure factor. Besides small changes in the nearest neighbor distances, our results underscore the importance of anisotropy in the structure of out of-equilibrium systems, in agreement with structure analysis of jammed and unjammed granular packings.

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