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Hardening and yielding in colloidal gels EMANUELA DEL GADO, JADER COLOMBO, MEHDI BOUZID, Georgetown University — Attractive colloidal gel networks are disordered elastic solids that can form even in extremely dilute particle suspensions. With interaction strengths comparable to the thermal energy, their stress-bearing network can locally restructure via breaking and reforming inter-particle bonds. We use molecular dynamics simulations of a model system to investigate the strain hardening and the yielding process. During shear start up protocol, the system exhibits strong localization of tensile stresses that may be released through the breaking and formation of new bonds. In this regime, the small amplitude oscillatory shear analysis shows that the storage and the loss modulus follow a power law behavior that are closely reminiscent of experimental observations. At large accumulated strains, the strain-induced reorganization of the gel may trigger flow heterogeneities and eventually lead to the yielding of the gel via a quasi brittle damage of its structure.

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