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Influence of Flow Quench Rate on the Internal Stress and Aging Dynamics of a Repulsive Colloidal Glass[1] CHINEDUM OSUJI, AJAY SINGH NEGI, Department of Chemical Engineering, Yale University — We investigate the dynamics of aging in a repulsive colloidal glass composed of charged clay particles in aqueous suspension. Dynamic rheological measurements show a power law evolution of the elastic modulus of the system with sample age, measured as time elapsed after the cessation of a rejuvenating shear flow. We show that the scaling exponent is dependent on the rate of flow cessation or the flow quench rate. Comparatively fast quenches lead to systems with a smaller elastic modulus and accelerated aging whereas slower quenches result in higher modulus but correspondingly less rapid aging. We apply a recently proposed technique to follow the dynamics of residual or internal elastic stresses immediately after the flow arrest and find striking parallels between the relaxation of these stresses and the aging of the system. These results indicate that the evolution of the slow dynamics is strongly coupled to the internal stress state of the system and point to the identification of the flow quench rate as a mechanical variable that characterizes the system's departure from equilibrium.

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