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Microrheology of an aging colloidal glass S. JABBARI-FAROUJI, Univ. of Amsterdam, D. MIZUNO, M. ATAKHORRAMI, Free Univ. of Amsterdam, E. EISER, Univ. of Amsterdam, C. SCHMIDT, F. MACKINTOSH, Free Univ. of Amsterdam, G. WEGDAM, D. BONN, Univ. of Amsterdam — Laponite is a synthetic clay which after mixing with water, spontaneously evolves from an initially liquid and ergodic state to a non-ergodic glassy state that exhibits elastic behavior. We provide a direct experimental test of the Stokes-Einstein relation as a special case of the fluctuation-dissipation theorem (FDT) in this aging colloidal glass. The use of combined active and passive microrheology allows us to independently measure both the correlation and response functions in this non-equilibrium situation. Contrary to previous reports, we find no deviations from the FDT over several decades in frequency (1 Hz-10 kHz) and for all the observed aging times. Our measurements also demonstrate the applicability of fluctuation-based (passive) microrheology in a non-equilibrium glassy system. This method allows obtaining the viscoelastic properties over a very wide frequency range. Our striking observation is that there is a cross over in frequency behavior of complex shear modulus of system from single power law at early stages of aging to two power laws at later stages. This suggests the existence of two distinct viscoelastic contributions in the aging glass: (i) a high-frequency viscoelastic response in which the shear modulus increases rapidly with frequency; and (ii) a predominantly elastic (weakly frequency-dependent) response at lower frequencies, which becomes increasingly important as the system ages.

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