

# Remarkable Relaxation Dynamics in BSA-GB Mixed Dispersion: Ergodic to Non-ergodic Transition

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## Abstract

Herein, we report interaction between Gelatin B (GB) and Bovine Serum Albumin (BSA) which is mainly arising from surface selective patch binding occurring at their common pI ( $\approx 5.0 \pm 0.5$ ). The dispersion remained homogeneous with no indication of either complex formation or phase separation, but the dispersion turns gel-like phase over time. It was found that the initial tenuous network of GB provided a scaffold for network organization, the BSA molecules aggregated along the GB chains, and functioned as cross-linking agent, and more elastic gels were obtained for samples with higher GB content. We probe this dynamics in finer details and the gel phase displayed considerable change with aging time as the system moved from ergodic to non-ergodic state. GB-BSA based system exhibited anomalous relaxation in gels changing with aging time  $t_w$  at their common pI. At  $t_w = 0$ , the correlation function exhibited one relaxation mode due to the system residing deeply inside the ergodic phase and purely mirroring Brownian dynamics. After a characteristic waiting time, an additional mode (slow relaxation) appeared which was attributed to inter-chain interaction induced reorganization of entanglements.

**Keywords:** Dynamic Light Scattering, Ergodic-Non Ergodic Phase, Gel Structure Development, Mixed Protein Dispersion, Relaxation Dynamics in Gels