Synopsis of Original Research Paper

Study on the gelation process of aggregative protein solutions

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The aggregation mechanism and aggregated structure of globular protein, β-lactoglobulin (β-LG), have been studied by dynamic light scattering (DLS) and small angle neutron scattering (SANS). DLS shows that time intensity correlation functions for β-LG solutions prepared at pH 2 and 7 indicated a power law behavior around gelation threshold. The critical exponent related to the relaxation time, n, was 0.5 at pH2 and 0.7 at 7, which can be explained by percolation theory without and with excluded volume effect, respectively. It is known that the value $n \cong 0.66$ suggests a highly branched percolated cluster. On the other hand, a lower value of n is expected for a chain-like structure where the excluded volume is screened. SANS results show that the scattered intensity for β-LG at pH 2 increased with heat-induced aggregation, while that at pH 7 exhibits a distinct maximum at the scattering vector, $q = 0.025 Å^{-1}$. This is due to microphase separation, which was well reproduced by the Borue-Erukhimovich theory of weakly charged polyelectrolyte solutions.