
Size and Shape of Allophane Particles in Dispersed Aqueous Systems

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Abstract: Aqueous suspensions of allophane show relatively high viscosity, presumably because of strong particle interaction between the unit particles. To test this hypothesis, we measured the particle weight and particle size of allophane during a dispersion using the light scattering method. The particle weight was more than several hundred times larger than that of the unit particle, and the size was 100– 400 nm, whereas the Stokes' diameter of the particles in the sample was less than 50 nm. Particle weight and size varied with the pH of the sample. Particle sizes were cross-checked by ultrafiltration through membrane filters. The experimental findings show that the unit particles of allophane within dilute dispersions appear to be associated like strings of beads, forming domains (primary floccules) about 100 nm in diameter. When these domains coagulate under certain conditions, they do not grow analogously but form clusters, such as secondary floccules, then precipitate. Formation of secondary flocculation of loose structure accounts for the maximum relative viscosity at the transition pH between dispersion and coagulation.

Key Words: Allophane • Cluster • Colloid • Domain • Light Scattering • Shape • Size • Ultrafiltration • Viscosity

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