Critical Phenomena and the Mechanism of Stratification in Solutions

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The phenomenon of stratification was studied by spectroscopic methods in homogeneous solutions. A mechanism is proposed for stratification in homogeneous solutions based on data and principles from accepted physical and chemical models for solutions.

The basis of the present mechanism is that every particle is taken as a wave packet with a certain vibration frequency. Due to these interactions, induced dipole moments or phase fluctuations are present. Realization of phase coherence between the separate harmonics of the fluctuations leads to the localization of particles and to the formation of the condensed state of the substance.

For a mixture consisting of particles A and B, the realization of phase coherence leads to mixing of the particles and the formation of a homogeneous solution. External influences, such as changes in temperature, will change the vibration frequencies of particles A and B. These changes may result in critical unstable states, and, in specific cases, may lead to stratification. This is the region of strong fluctuation phenomena.

In cases where the interaction energy between particles are comparable to the energy of the fluctuation field, an unstable state or the precursor to stratification may be observed. If like-particle interactions dominate, stratification of the solution into separate components may occur. When the frequency changes result in cross interactions being dominant (or comparable), a homogeneous solution may result. Experimental results for stratification of solutions are explained in the context of this theory.