H. TANAKA LAB.

[Soft matter: A new basic principle behind the cooperation among multiple functions in a dynamic hierarchical system]

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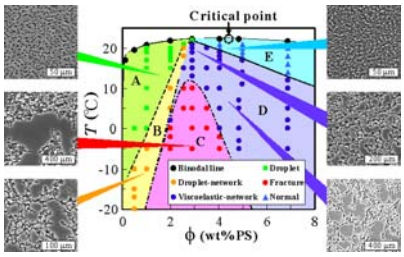
The Physics of Soft Matter

Soft matter: A new basic principle behind the cooperation among multiple functions in a dynamic hierarchical system

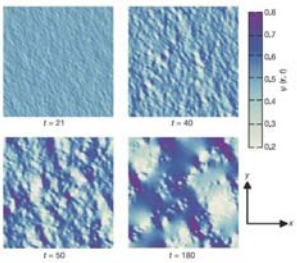
One of the most characteristic features of soft matter (e.g., polymers, liquid crystals, and colloids) is its hierarchical structure. Recent studies indicate that even a simple liquid has a similar level structure. It is expected that complex couplings among the different levels of such a hierarchical structure play a crucial role in the cooperativity of functions of soft and biological matter. However, there have so far been few studies on the role of hydrodynamic interactions on inter-level couplings and how the level structure of a liquid itself affects functions of soft matter. Focusing on these problems, we aim at understanding the basic physical principles behind the cooperation among multiple functions, which is unique to soft and biological matter.

◆Research Topics

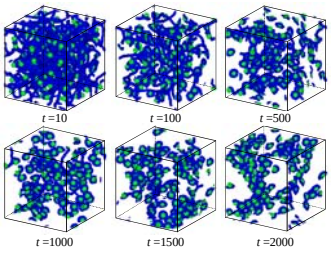
◆Viscoelastic Phase Separation
◆Flow-induced instability and fracture
◆Hydrodynamic interactions in soft matter: colloids, polymers, proteins, membranes
◆Single-particle-level observation of structure and dynamics of colloidal systems
◆Mechanism of glass transition
◆Mechanism of liquid-liquid transition in a single-component liquid



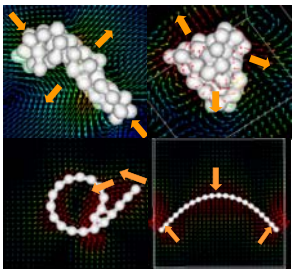
Various phase separation behaviours observed in polystyrene-diethyl malonate mixtures



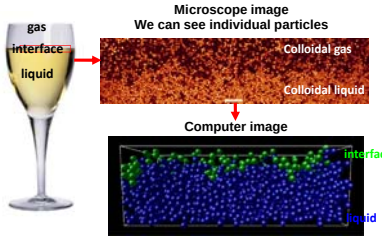
Liquid instability induced by simple shear flow



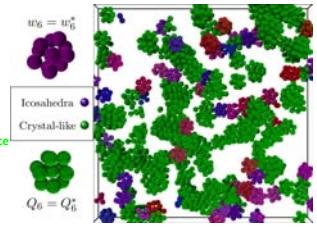
Aggregation of colloids induced by topological defects in nematic liquid crystal



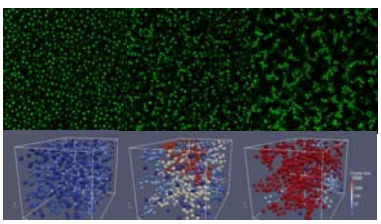
Flow field around a polymer undergoing a coil-globule transition



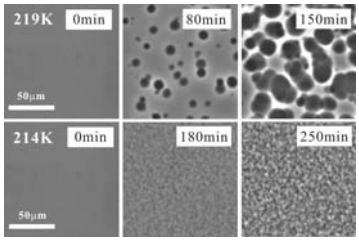
Single-particle-level observation of the gas-liquid interface of a colloidal fluid



Locally ordered regions in a colloidal supercooled liquid near the glass transition (Reconstructed from experiments).



Single-particle-level observation of a gelation process in a colloidal dispersion



Process of liquid-liquid transition in triphenyl phosphite