

H. TANAKA LAB.

[Study of Liquids and Soft Matter Focusing on their Spatio-Temporal Hierarchies]

Department of Fundamental Engineering

The Physics of Liquids and Soft Matter

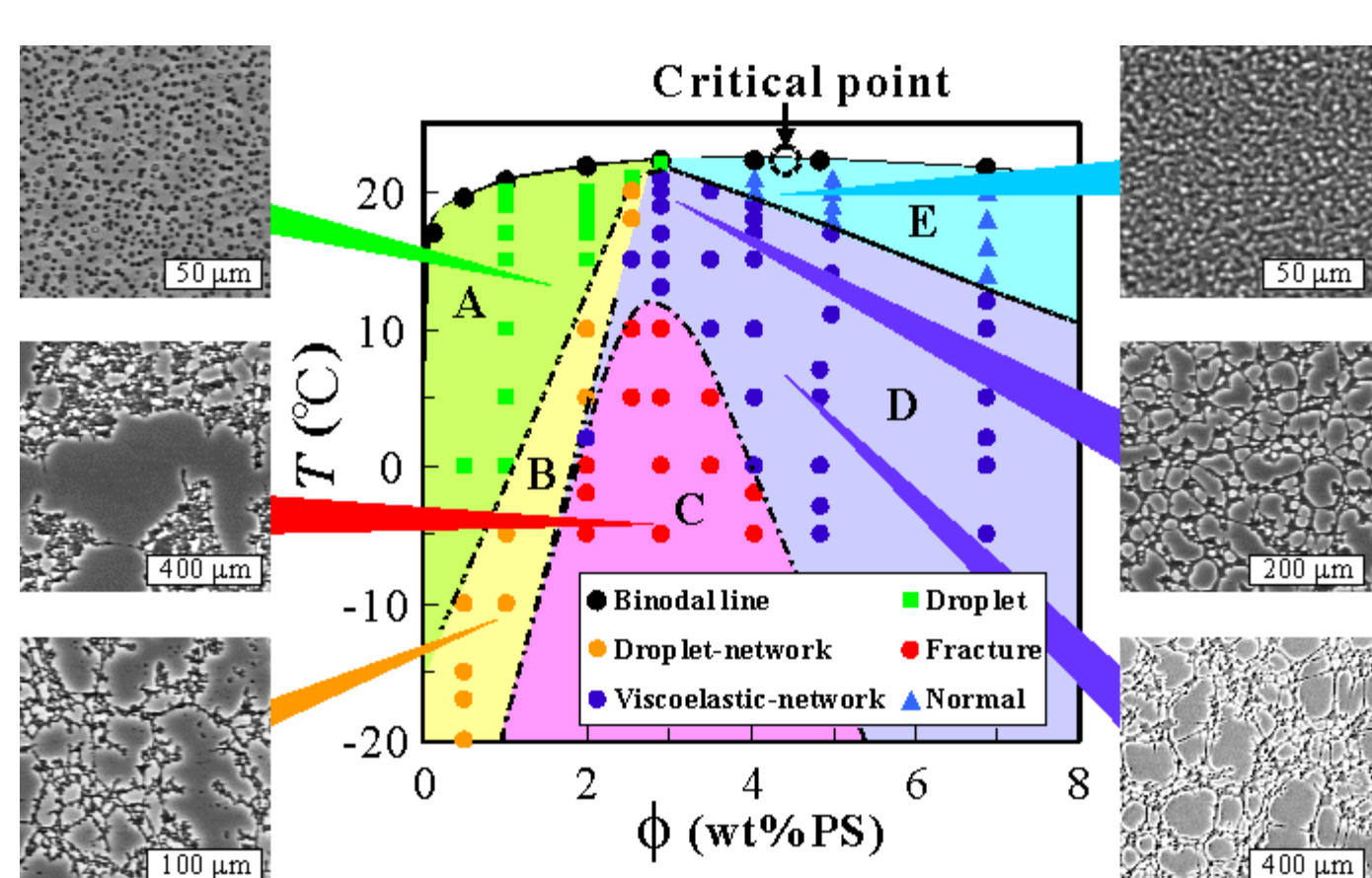
Faculty of Engineering, Department of Applied Physics

<http://tanakalab.iis.u-tokyo.ac.jp>

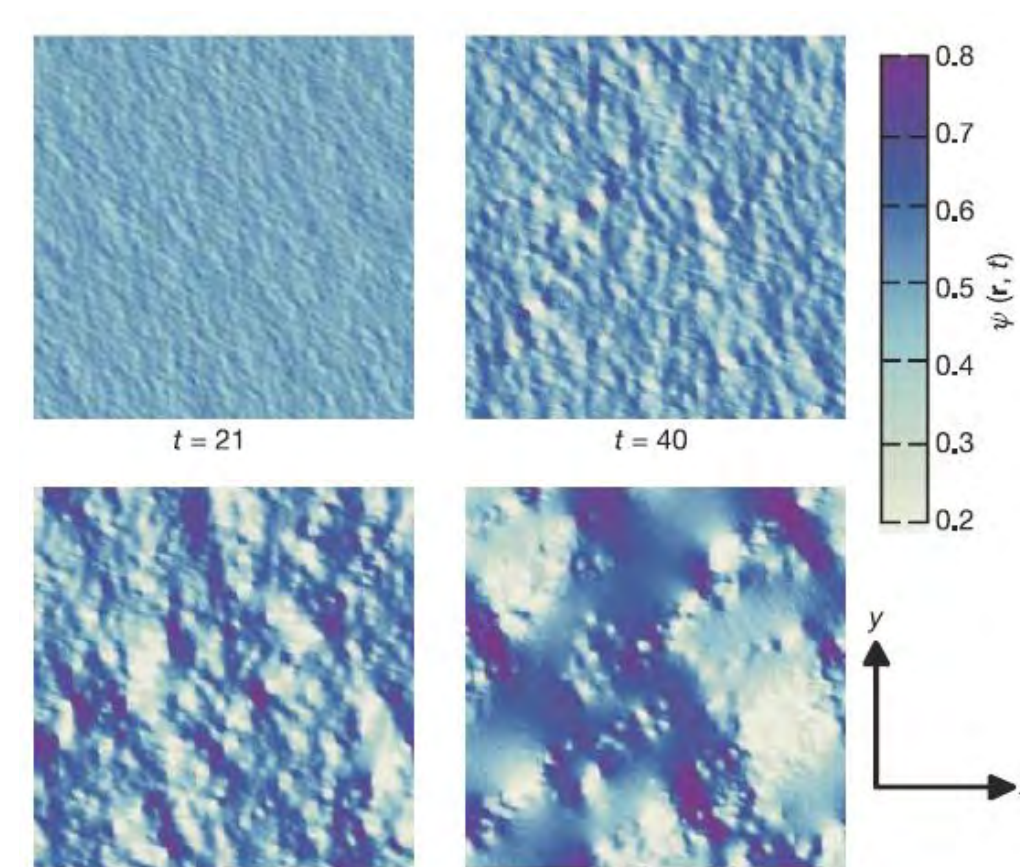
Study of Liquids and Soft Matter Focusing on their Spatio-Temporal Hierarchies

Despite the fact that the liquid state of matter is of fundamental importance in our life, our physical understanding of it is far behind those of the gas and solid states. In our laboratory we are aiming at drawing a unified physical picture covering the following seven unsolved fundamental problems on liquids and soft matter, focusing on the commonality of their spatio-temporal hierarchical structures. We expect our study will bring new developments not only in the physics of liquids and soft matter, but also in their applications.

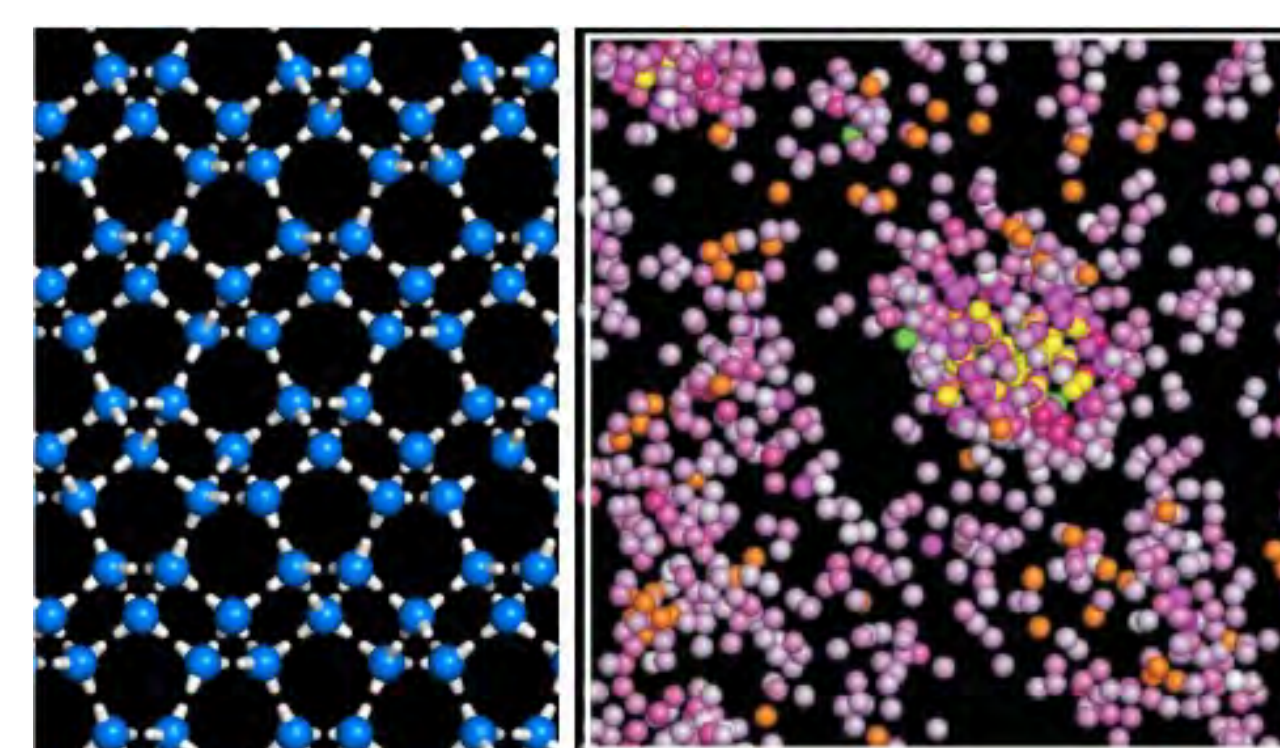
- ◆ Thermodynamic and kinetic anomaly of water and water-like liquids
- ◆ Mechanism of liquid-liquid transition in a single-component liquid
- ◆ Mechanism of liquid-glass transition
- ◆ Relationship between a hierarchical structure of liquid and its crystallization
- ◆ Nonlinear flow behavior of glassy liquids and granular matter and the mechanism of flow instability and fracture
- ◆ Roles of hydrodynamic interactions on the dynamics of soft and bio-matter
- ◆ Phase transition dynamics and pattern evolution in soft and bio-matter



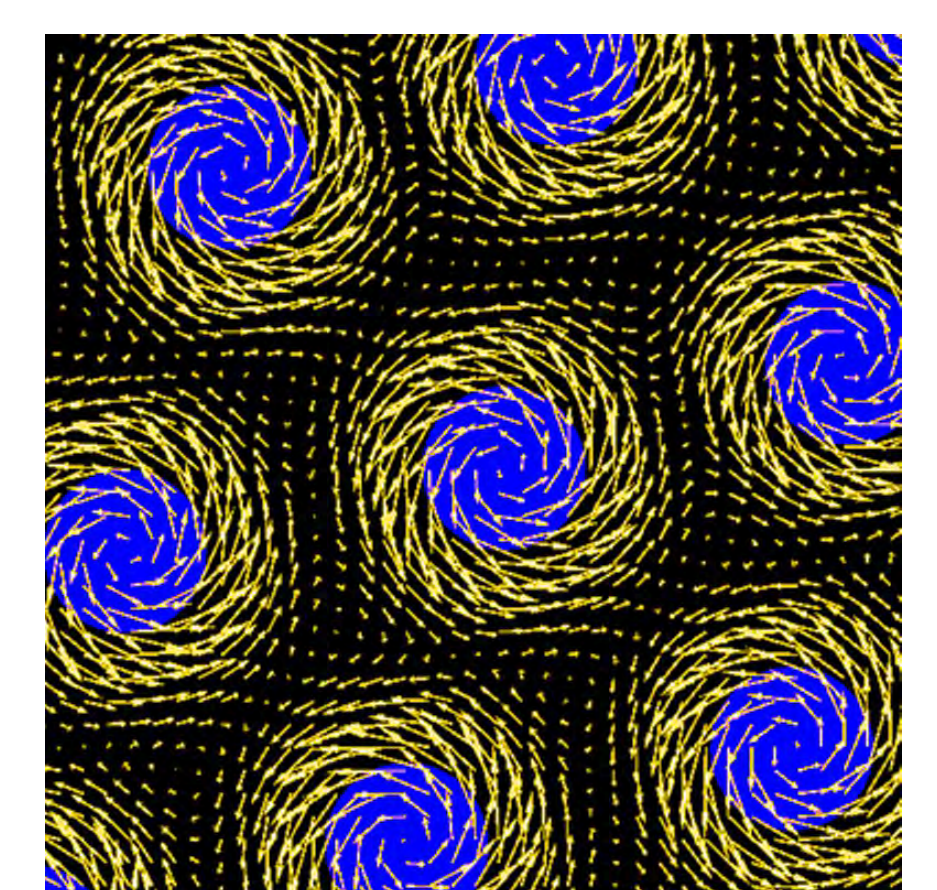
Various phase separation behaviours observed in polystyrene-diethyl malonate mixtures



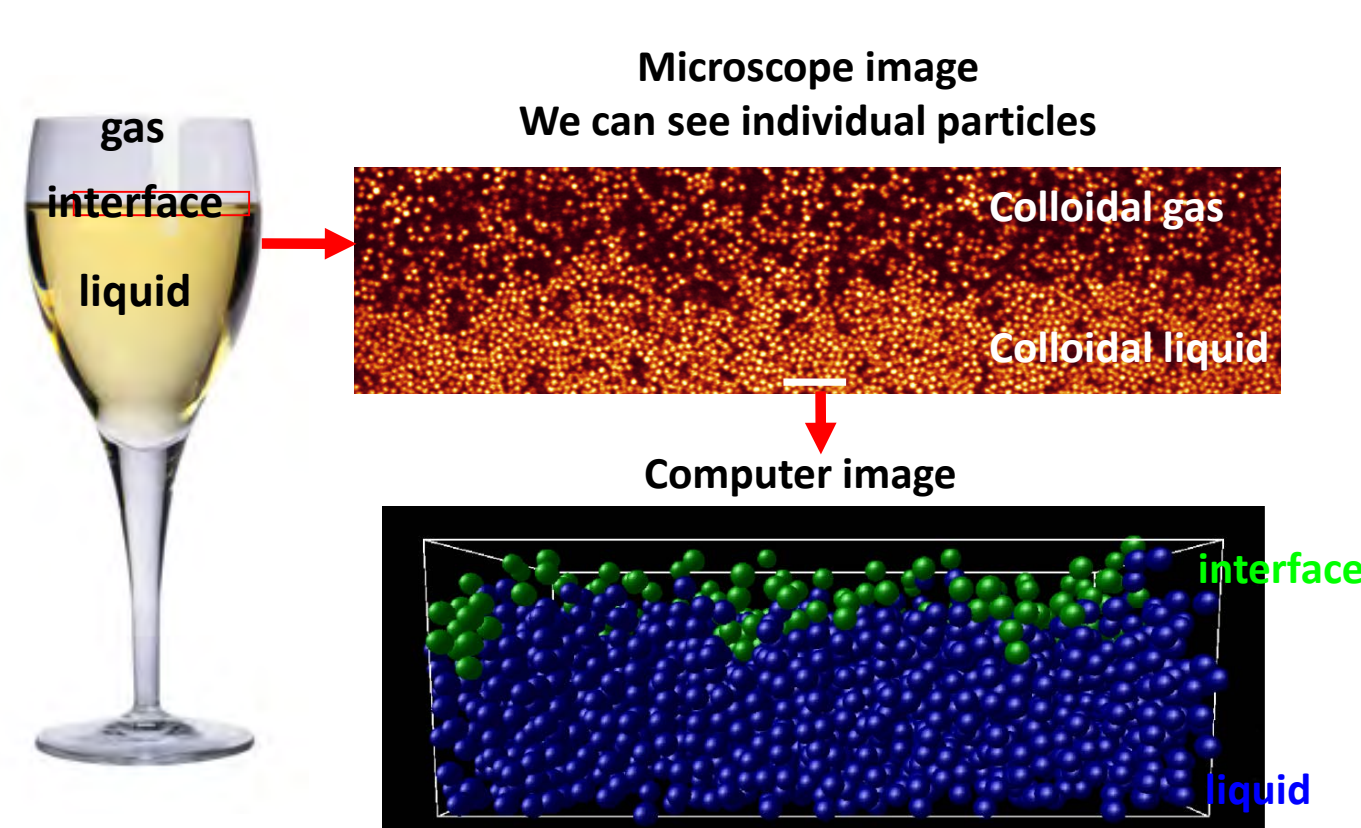
Liquid instability induced by simple shear flow



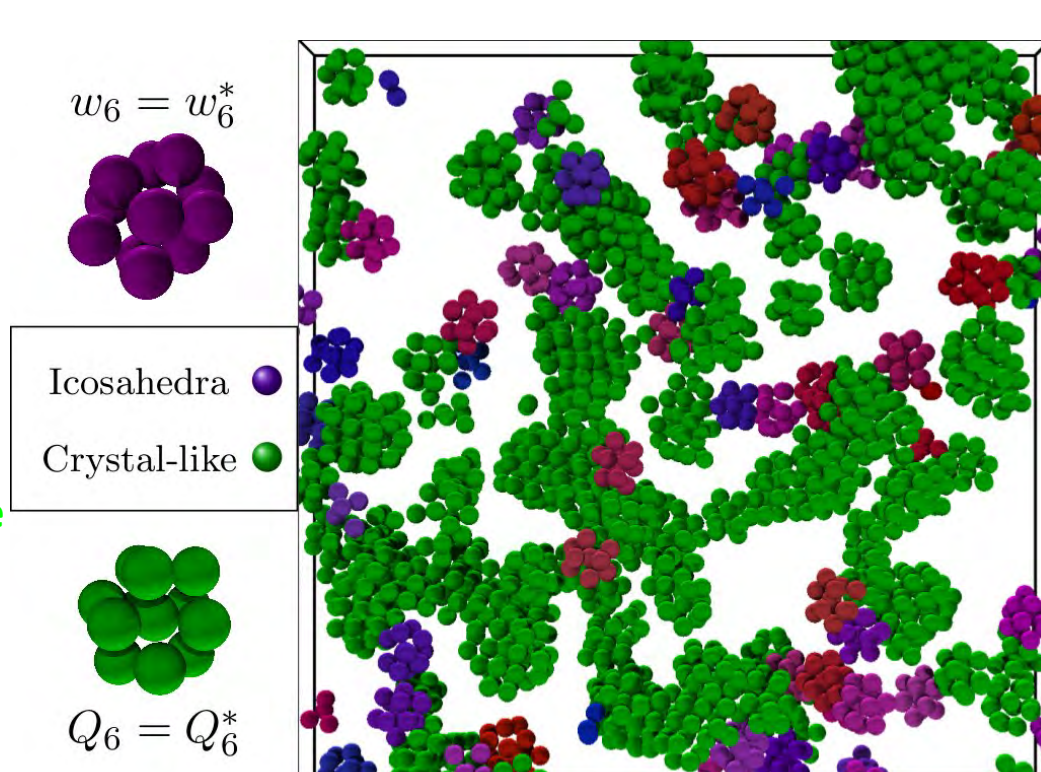
A newly discovered ice (left) and the birth of an ice crystal (right)



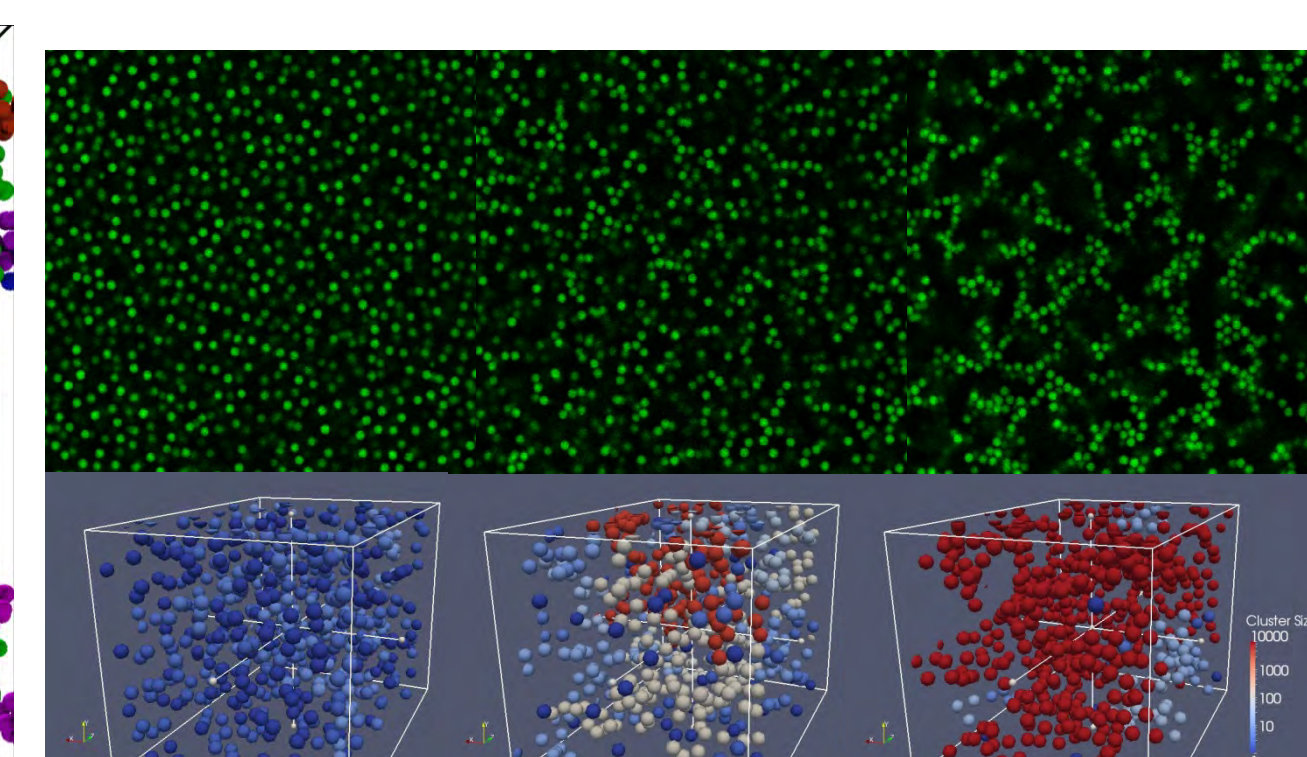
Self-assembly of hydrodynamic flow



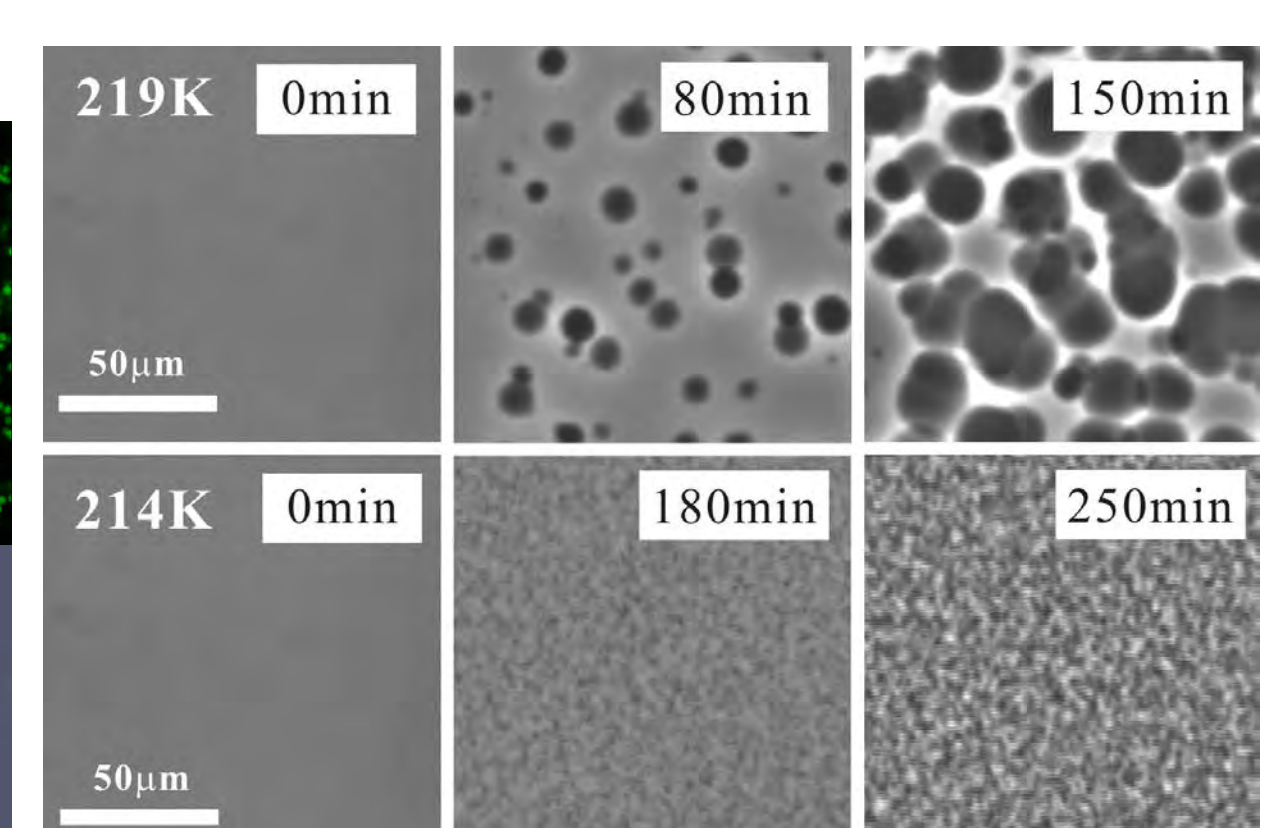
Single-particle-level observation of the gas-liquid interface of a colloidal fluid



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