

SUMMARY OF Ph.D. DISSERTATION

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Title Control of Spontaneous Pattern Formation on Liquid Film and Its Influence on Surface Property		
Abstract <p>Temporal and spatial patterns such as cardiac pulsation and color patterns of body surface of animals are ubiquitous in nature. The concept called dissipative structure explained that the pattern formations are self-organization in far-from-equilibrium system due to the growth of fluctuation. In this study, spontaneous pattern formation on liquid film was controlled base on this concept and its influence on surface property was investigated.</p> <p>Chapter 1 summarizes the background and previous studies.</p> <p>Chapter 2 describes a coating agent containing hydrophobic nano-particle and silicone resin or linseed oil. It exhibited super-hydrophobic property when the content of the particle was 80wt%. The highly water-repellent oleo-liquid film surface prepared by the coating agent was found to be transformed to super-hydrophilic surface by calcinations.</p> <p>Chapter 3 describes spatially periodic dewetting structures such as long cylindrical ridged patterns or droplet patterns were spontaneously formed by immersing the oleo-liquid film on the glass plate into water. The spatial periodicity of the dewetting pattern may be due to the first stage of dewetting, i.e. spinodal dewetting, followed by the second stage, i.e. growth and coalescence of holes. The generation of dewetting patterns, however, did not enhance hydrophobicity of the surface.</p> <p>Chapetr 4 describes fabrication of double roughness structures using two types of dissipative structure, a directional viscous fingering and a spinodal dewetting. Mesoscopic protrusion structures and microscopic hairy structures coexist on super-hydrophobic Lotus leaves. The oleo-liquid film on which sub mm scale of directional directional viscous fingering pattern by dragging coat and μm scale of spinodal dewetting pattern by water showering coexisted showed highly water-repellent property.</p> <p>Chapter 5 describes spatially periodic double roughness structures, which were also prepared by spreading oleo-liquid film on the glass plate by spin-coating followed by the water showering. The surface on which radial pattern by spin coating and spinodal dewetting pattern formed showed super-hydrophobicity.</p> <p>Chapter 6 summarizes the results of this study.</p>		