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◆研究キーワード

ソフトマター物理　／　秩序形成　／　バイオマター物理

◆主要業績

・Effects of Grafted Polymer Chains on Lamellar Membranes
T. Masui, M. Imai, K. Nakaya and T. Taniguchi
J. Chem. Phys. 124, 074904　(12pages)　(2006).

・Microdomain Formation in Model Biomembranes
T. Masui, M. Imai, and N. Urakami
Physica B 385&386, 821-823　(2006).

・Polymer Crystallization from the Metstable Melt:
The formation mechanism of spherulites
M. Imai and K. Kaji
Polymer 47, 5544-5554　(2006).

・Growth Dynamics of Domains in Ternary Fluid Vesicles
M. Yanagisawa, M. Imai, T. Masui, S. Komura and Takao Ohta
Biophysical J. 92, 115-125　(2007).

・Repulsive inter-lamellar interaction induced by addition of colloidal particles
Y. Suganuma, M. Imai and K. Nakaya
J. Applied Crystallography 40, s303-s306　(2007).

◆Research Pursuits

We have studied the growth dynamics of domains on ternary fluid vesicles composed of saturated (DPPC), unsaturated (DOPC) phosphatidylcholine lipids, and cholesterol using a fluorescence microscopy. The domain coarsening processes are classified into two types; normal coarsening and trapped coarsening. For the normal coarsening, the domains having flat circular shape grow in a diffusion-and-coalescence manner and phenomenologically the mean size grows as a power law of ～ t2/3. The observed growth law is not described by a two dimensional diffusion-and-coalescence growth mechanism following the Saffman and Delbru ¨ ck theory, which may originate from the two-body hydrodynamic interactions between domains. For the trapped coarsening, on the other hand, the domain coarsening is suppressed at a certain domain size because the repulsive inter-domain interactions obstruct the coalescence of domains. The two-color imaging of the trapped domains reveals that the repulsive interactions are induced by the budding of domains. The model free energy consisting of the bending energy of domains, the bending energy of matrix, the line energy of domain boundary and the translation energy of domains can describe the observed trapped coarsening. The trapping of domains is caused by the coupling between the phase separation and the membrane elasticity under the incompressibility constraint.