17. The Aggregation of Oriented Anisotropic Particles

S. Miyazima*, P. Meakin@ and F. Family8

*Department of Engineering Physics, Chubu University, Kasugai, Aichi 487, Japan
@Central Research and Development Department, Experimental Station, E.I. duPont de Nemours and Company, Inc. Wilmington, DE 19898
8Department of Physics, Emory University, Atlanta, GA 30322

The formation of cluster by the aggregation of small objects and by growth processes is a subject of considerable interest and of practical importance in physics, chemistry, biology, medicine, and engineering. In practice there are a lot of aggregation phenomena such as particles with induced dipole moments in an external field, magnetic particles in an external field and polymerization in an ordered liquid crystal.
Aggregation in ferrofluid is a particularly interesting example with considerable scientific and practical importance. In this paper the limited aggregation of oriented anisotropic particles is investigated using computer simulations. Figure 1 below shows patterns formed linear rods in the 512X 512 square lattice. Initially 8000 particles are distributed and the average cluster size is 20.19 and diffusion constant is assumed to be proportional to $s^{-1}$. Figures 2(a) and 2(b) below show patterns formed linear rods in 3-dimensional cubic lattice (128$^3$), where 10,000 particles and distributed initially and average cluster size is 40. Figures 2(top two) are intersected by a plane including the external field and Figs. 2 bottom right and left are a projection onto and an intersection by a plane respectively that is perpendicular to the external field. The aggregation process is well described by the cluster-size distribution function $N_s(t)$, which is the number of clusters of size $s$ at time $t$.

By the dynamic scaling theory the time dependent cluster-size distribution can be represented by the scaling form $N_s(t) = s^{-7}f(s/S(t))$ where $S(t)$ is the mean cluster size. At high particle densities a crossover from two (or three) dimensional behavior to that that is characteristic of a one dimensional system is found.

18. 液晶の秩序化過程に於けるパターン形成

名大・工 長屋智之，折原宏，石橋善弘

§ 1. はじめに

Allen-Cahn によって理論的に研究された非保存系界面の運動1）は，Cu₃Au や Ni₃Mn などの秩序-無秩序転移をする合金を急冷する実験2,3）によりX線などを使って観測することができるが，折原らによって考案された TNセル（Twisted Nematic cell）を使った液晶の急冷実験4）