No. EAR2-007-02 First registration: 2000/2/2 New: 2001/11/14

Title	Micro- and macro-phase separations of AB block copolymer / A and B homopolymers blends
Researchers	Hiroya Kodama, Shigeyuki Komura and Keizo Tamura
Purpose of this study	The aim of this study is to see the effect of molecular weight of individual components on internal structures formed by phase-separated interfaces, where block copolymers accumulate. Origin of polymeric microemulsion structures observed by Bates et al. is also of interest.
System (Material)	diPE-PEP/PE/PEP blends. F. Bates, et al., Phys. Rev. Lett. 79 (1997) 849.
Program (including analysis)	a tentative SCF program(equivalent to SUSHI)
Method & Some important input parameters	(Method) Numerical calculations based on a self-consistent mean-field method. Characteristic length of structures and free energy profiles are analyzed. (Input parameters) chain length of block copolymer and homopolymers χ parameter composition
Advance & Problem	(Advance) Equilibrium micro- and macro-phase separated structures of blends of AB block copolymer and A and B homopolymers are studied using a self-consistent field theory by means of numerical calculations. It has been shown that block copolymer brush formed at AB interfaces becomes dry as homopolymers become longer relative to the block copolymers. In the case that the homopolymers are longer than block copolymers, three-phase coexistence among lamellar, A-rich and B-rich homogeneous phases is observed. Analysis of the free energy profiles in extremely swollen lamellar phase reveals marginal stability of such periodic structures against fluctuations of interfacial separations. (Problem) Stability of polymeric microemulsion can not be discussed, because the fluctuation effect of interfacial configurations is neglected in ordinary SCF treatment.
References	[Manuscript] Accepted (2000/10/25) H. Kodama, S. Komura and T. Tamura, *Europhys. Lett.* 53 (2001) 46 [Presentation] 1999/11/8-12 Tohwa StatPhys'99, Japan
KeyWords (in English)	mean-field theory, ternary blend, block copolymers, phase separation, microemulsions, lamellar phase

Results (Remarks)

[Inputs]

A homopolymers: chain length N_A, monomer volume fraction Φ_A

B homopolymers: chain length N_B, monomer volume fraction Φ_B

Symmetric AB diblock copolymers: chain length N_{AB},

monomer volume fractions: A block; Φ_a, B block; Φ_b

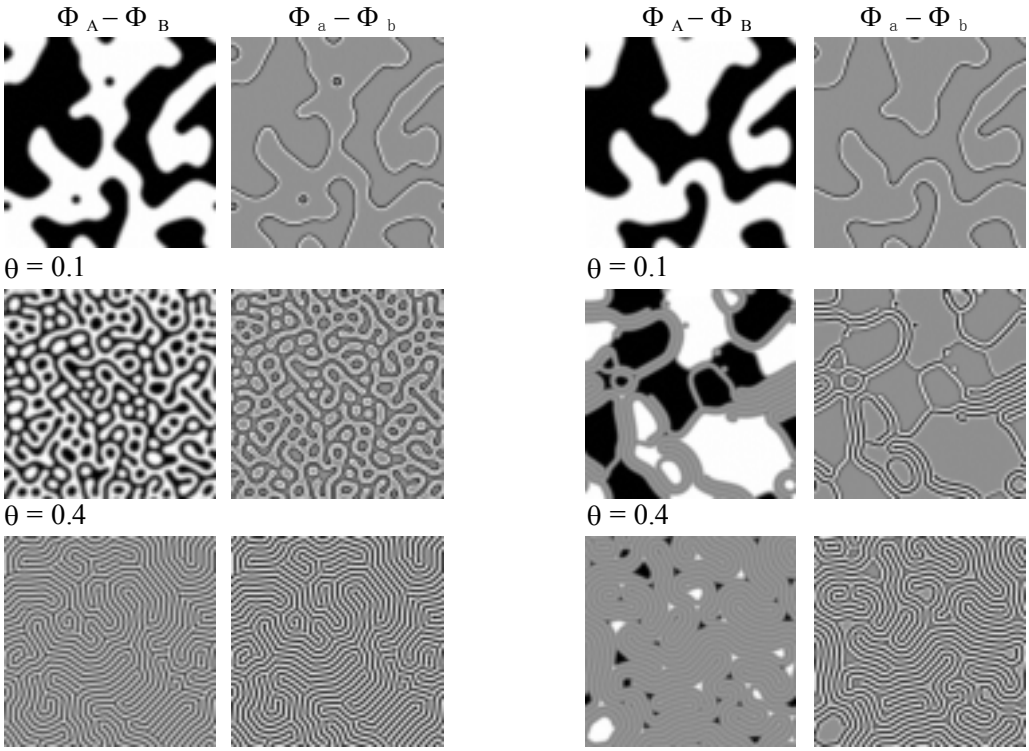
χ-parameter between A and B

volume farction

A, B homopolymer; 1:1, A block; θ

[Results]

monomer volume fraction profiles



$N_A=N_B=4$, $N_{AB}=8$, $\chi=2$ $N_A=N_B=16$, $N_{AB}=8$, $\chi=2$

free energy profiles