

Molecular orientation dynamics on the structural rheology in diblock copolymers

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Diblock copolymers exhibit various periodic microphase structures in thermal equilibrium. Rheology of these mesoscopic structures has been investigated to characterize the dynamics properties of the various structures. Tamate et. al. formulated an analytical theory of viscoelasticity for interconnected double gyroid structures. They considered concentration variation under shear flow and calculated the energy dissipation due to the deformation of interconnected structures in the weak segregation limit. However, when there is only one magnitude of reciprocal wave vectors for periodic structures such as lamellar, hexagonal and body-centered-cubic (BCC) structures, the linear part of loss modulus is absent[1].

The above fact indicates that one needs to introduce generally a new variable to describe the structural rheology of phase-separated diblock copolymers. We formulate a viscoelastic theory of micro-phase separated structures in diblock copolymers in which the local composition is coupled with the molecular orientation. The linear viscoelastic response is investigated for lamellar structure. Three kinds of complex moduli and viscosities characterizing an incompressible lamellar structure are obtained up to the leading order of the coupling[2].

1. R. Tamate, K. Yamada, J. Vinals, and T. Ohta, *J. Phys. Soc. Jpn.*, 2008, **77**, 034802.
2. S. Yabunaka and T. Ohta, *submitted*.