〈総　　説〉

ポリマーブレンドにおける相溶性・相分離と目的の物性を得るための構造制御

Miscibility of Polymers and Phase Separation of Polymer Blends ～ Design and Control of Phase-Separated Structures for Desired Properties ～

櫻井　伸一

Abstract

In this review, the following subjects are summarized; polymer miscibility, phase diagram of polymer blends, experimental technique to examine phase separation in polymer blends, experimental technique to evaluate polymer miscibility, mechanism of phase separation via spinodal decomposition, experimental analysis on the random two-phase structures due to phase separation, peculiar optical property owing to anisotropic shape of nano-cylinders of block copolymers (form birefringence), and peculiar structures of phase separation organized by convection in polymer blend solution under temperature gradient. The final subject is provided as an example of varieties of controlling phase-separated structures of polymer blends, and creation / development of novel structure of polymer blends. This would be a clue how to create novel polymer materials with desired properties through designing and controlling of phase-separated structures.

キーワード：ポリマーの相溶性、ポリマーブレンドの相分離、相図、スピノーダル分解、構造制御、自己組織化、階層構造、対流、光散乱、X線散乱、中性子散乱

Keywords: Miscibility of Polymers, Phase Separation in Polymer Blends, Phase Diagram, Spinodal Decomposition, Structure Control, Self-Organization, Hierarchical Structures, Convection, Light Scattering, X-ray Scattering, Neutron Scattering

1.　はじめに

水と油は混ざらない。2種類の液体を混ぜることができるかどうかは、太古の昔から人類の興味の対象であり、科学的な研究は19世紀後半から、熱力学の発展とともに進められてきた。「液体を混ぜる」という表現は極めて曖昧で科学的ではない。白黒の碁石が混ざるような現象を述べているのではないことに注意して頂きたい。分子のスケールでの混合、すなわち、

2025年10月27日受付
SAKURAI Shinichi
京都工芸繊維大学・繊維学系・バイオベースマテリアル学専攻