

リビングラジカル重合による両親媒性/ 機能性高分子の精密合成と材料創成

Precision Synthesis and Material Design of Amphiphilic/ Functional Polymers via Living Radical Polymerization

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Abstract

In this paper, we report recent advances on the precision synthesis of functional polymers via living radical polymerization for structure-controlled materials, especially focusing on water-soluble/amphiphilic polymers that are potentially related to painting materials and coating technologies. Amphiphilic random, block, and gradient copolymers with controlled molecular weight and sequence distributions can be synthesized by living radical polymerization or tandem living radical polymerization coupled with monomer transesterification. Cyclopolymers consisting of large in-chain rings are obtained from cation template-mediated cyclopolymerization of poly (ethylene glycol) dimethacrylate to give pseudo crown ether polymers for selective molecular recognition. Functional microgel star polymers are prepared by the linking reaction of macroinitiators with functional linkers or monomers and serve as nanocapsules for molecular encapsulation. Amphiphilic random copolymers bearing hydrophilic poly (ethylene glycol) and hydrophobic alkyl groups induced chain folding and precision self-assembly in water to form small micelles; the size, aggregation number, and thermoresponsive behavior can be controlled by the pendant structures, degree of polymerization, and composition of the copolymers.

キーワード : リビングラジカル重合、精密高分子合成、両親媒性高分子、星型ポリマー、自己組織化
Keywords : Living radical polymerization, Precision polymer synthesis, Amphiphilic polymer, Star polymer, Self-assembly

1. はじめに

塗料は、材料の見た目を美しくし、その表面をコーティングして保護する機能をもつ。その

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塗料は、色彩の元となる顔料に加え、顔料の保持と塗膜の連続相を担う樹脂、さらにそれらを溶解・分散させる溶剤や添加剤で構成される。塗料には、アクリル樹脂などに代表される合成高分子がよく利用され、最近では環境への配慮から、水系塗料のための水溶性／両親媒性高分子も多く開発されている。顔料の分散性は、高分子を構成するモノマー構造のみならず、高分