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Education

Ph. D. (June, 1985), M. Sci. (March, 1982), B. Sci. (March, 1980): Osaka University

Academic Carrier

1985 (October)-1986 (December): Guest Scientist, National Bureau of Standard, USA
(supervisor: Dr. Charles C. Han)

1987 (March): Assistant Professor, Department of Macromolecular Science, Faculty of Science, Osaka University

1996 (July): Associate Professor, Department of Macromolecular Science, Graduate School of Science, Osaka University

2002 (October)-: Professor, Department of Macromolecular Science, Graduate School of Science, Osaka University

Awards and Honors

The Society of Polymer Science, Japan (SPSJ) Award (2008). Award for Encouragement of Research in Rheology; The Society of Rheology, Japan (1998).

Total Publications

More than 100 original papers.

Research Interests

Recently, extensive efforts have been devoted to studies on structures and properties of macromolecular assemblies formed in solution. Associating polymers, bearing functional groups of strong attractive interactions, hydrophobic, solvophobic, electrostatic interactions, or hydrogen-bonding, form macromolecular assemblies in solution. There are many types of morphologies of macromolecular assemblies, e.g., spherical (star-like), cylindrical, bilayer, vesicular, flower, flower necklace, and flower network (bouquet) micelles. Those polymer micellar solutions have unique rheological properties, depending on the micellar size and morphology, and are used as additives to cosmetics, detergents, paints, personal care goods, foods, and so on. On the other hand, solutions of polymers without any specific functional groups of strong attractive interactions bring about the phase separation if the affinity between the polymer and solvent becomes bad. In those dilute solutions, the phase-separated concentrated phase often has a mesoscopic size, which may be regarded as another type of the macromolecular assembly. The mesoscopic phases sometimes exhibit interesting chiroptical properties, as demonstrated in my oral presentation. .

Phase-Separation Induced Circular Dichroism of Optically Active Polyfluorene Derivatives

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Polyfluorene, a π -conjugated polymer, has interesting electrical and optical properties, and attract increasing interests as candidates for organic light-emitting diode with high quantum yield and high hole mobility. Circular dichroism (CD), optical activity, and circular polarized luminescence are additional optical and electro-optical properties which enable the polymer to be utilized as optical devices or sensors. Several researchers were interested in those properties, and investigated optically active polyfluorene derivatives bearing chiral side chains. Although molecular modeling based on *ab initio* molecular orbital calculations indicated that the energetically favorable conformation of the polyfluorene backbone is a 5/2 helix, dilute solutions of optically active polyfluorene derivatives usually little exhibit CD. This implies that the optically active side chain hardly differentiates energies of the right- and left-handed helical conformations of polyfluorene backbone.

Recently, we found the phase-separation induced CD in dilute THF solutions of an optically active polyfluorene homopolymer¹ as well as chiral-achiral random copolymers² near the room temperature, by adding a non-solvent, methanol (cf. Figure 1). In the presentation, we discuss the detailed mechanism of the CD induction.

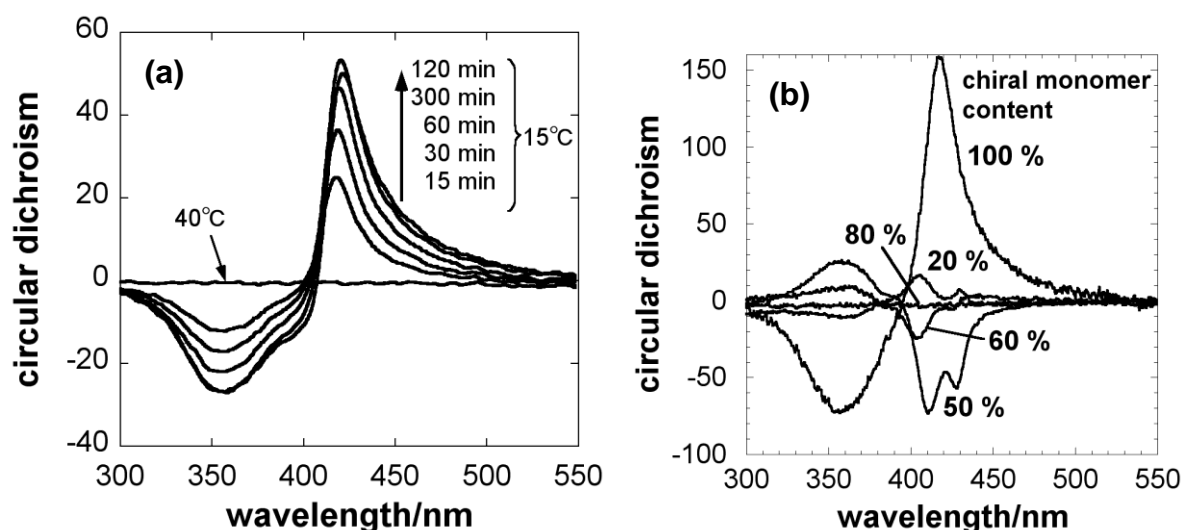


Figure 1. Induced CD spectra of an optically active polyfluorene homopolymer (a) and chiral-achiral random copolymers (b) in phase-separating solutions

(1) Sanada, Y.; Sato T. *Polym. J.* **2010**, *42*, 195-200.

(2) Sanada, Y.; Terao, K.; Sato T. *Polym. J.* **2011**, in press.