INDUCING UNIQUE POLYMERIC MORPHOLOGY BASED ON MOLECULAR ASSEMBLY: MODEL CASES FROM THERMOPLASTIC ELASTOMER SEBS AND/OR SUPRAMOLECULAR BENZOXAZINE

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ABSTRACT

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The present work focuses on inducing the polymer morphology via the molecular self-assembly approaches. In the first part, an existence of ordered-structure microdomains, nano-phase separation, of thermoplastic elastomers in as-spun electrospinning fibers is clarified through a study case of SEBS triblock copolymer using two-dimensional small angle X-ray scattering (2D-SAXS) technique. The work also shows that when the molecular interaction is formed the microdomain direction can be controlled as seen in the case of benzoxazine monomer (BZ) to induce microdomain orientation to be parallel to the fiber axis based on the π-π interaction between PS segment of SEBS and BZ monomer . In the second part, the work shows how the π-π interaction between PS segment of SEBS and BZ monomer leads to molecular pocket-like structure to control the polymerization of BZ and give polyBZ nano-sphere which is a simple approach to prepare thermosetting nano-sphere. In the final part, the work covers supramolecular chemistry of BZ dimers, so-called *N,N*-Bis(2-hydroxyalkylbenzyl)alkylamine, to prepare a novel diacetylene (DA) monomer containing BZ dimers based cyclic ether which will be an effective pathway for solid-state polymerization to obtain polydiacetylenes.

บทคัดย่อ

วันเฉลิม รุ่งสว่าง : การสร้างมอโฟโลจีของพอลิเมอร์ที่มีลักษณะเฉพาะโดยการจัดเรียงตัวเองในระดับโมเลกุล กรณีศึกษาจากเทอร์โมพลาสติกอิลาสโตเมอร์ เอสอีบีเอส และ(หรือ) เบนซอกซาซีนซุปปร้าโมเลกุล (Inducing Unique Polymeric Morphology Based on Molecular Assembly: Model Cases from Thermoplastic Elastomer SEBS and/or Supramolecular Benzoxazine) อ. ที่ปรึกษา : รองศาสตราจารย์ ดร. สุวบุญ จิรชาญชัย และ รองศาสตราจารย์ ดร.มาซายะ โคทากิ, 114 หน้า

วิทยานิพนธ์ฉบับนี้มุ่งเน้นไปที่การสร้างมอโฟโลจีของพอลิเมอร์ที่มีลักษณะเฉพาะโดยการจัดเรียงตัวเองในระดับโมเลกุล ในส่วนแรก งานวิจัยนี้ได้พิสูจน์ให้เป็นที่ประจักษ์ถึงการมีอยู่ของโครงสร้างที่เป็นระเบียบของไมโครโดเมน การแยกเฟสในระดับนาโน ของเทอร์โมพลาสติกอิลาสโตเมอร์ในเส้นใย อิเลคโตรสปินนิงผ่านกรณีศึกษาของ เอสอีบีเอส ไตรบล็อกโคพอลิเมอร์โดยใช้เทคนิคเอ็กซเรย์มุมแคบสองมิติ งานนี้ยังแสดงให้เห็นถึงว่าหากมีแรงอันตรกิริยาระหว่างโมเลกุลแล้วเราสามารถควบคุมการจัดเรียงตัวของไมโครโดเมนได้ด้วยดังเห็นได้จากกรณีของเบนซอกซาซีนมอนอเมอร์ซึ่งสามารถเหนี่ยวนำการจัดเรียงตัวของไมโครโดเมนในทิศทางขนานกับแกนของเส้นใยได้ เนื่องจาก แรงอันตรกิริยาของ พันธะพาย-พาย ที่เกิดขึ้นระหว่างช่วงของพอลิสไตรีนในสายโซ่เอสอีบีเอส และเบนซอกซาซีนมอนอเมอร์ ในส่วนที่สอง งานวิจัยได้แสดงให้เห็นถึงแรงปฏิกิริยาของ พันธะพาย-พาย ระหว่างพอลิสไตรีนในสายโซ่เอสอีบีเอส และเบนซอกซาซีนมอนอเมอร์ นั้นนำไปสู่โครงสร้างคล้ายกระเป๋าในระดับโมเลกุลเพื่อที่จะควบคุมปฏิกิริยาพอลิเมอร์ไรเซชันของเบนซอกซาซีนมอนอเมอร์ให้ได้พอลิเบนซอกซาซีนที่มีลักษณะทรงกลมที่มีขนาดระดับนาโน ซึ่งเป็นวิธีการที่ง่ายในการเตรียมเทอร์มอเซตที่มีลักษณะทรงกลมที่มีขนาดระดับนาโนได้อย่างไร ในส่วนสุดท้าย งานวิจัยนี้ยังคลอบคลุมถึง เคมี ซุปปร้าโมเลกุลของเบนซอกซาซีนไดเมอร์ หรือที่เรียกว่าสารประกอบ *เอ็น,เอ็น*-บิส(5-เมททิล-2-ไฮดรอกซีเบนซิล)เมททิลเอมีน เพื่อที่จะเตรียม ไดอะเซทิลีน มอนอเมอร์ซึ่งมีสารประกอบวงแหวนอีเธอร์ซึ่งเป็นวิธีที่มีประสิทธิภาพสำหรับปฏิกิริยาพอลิเมอร์ไรเซชันในสภาวะของแข็งเพื่อที่จะได้ พอลีไดอะเซทิลีนในขั้นต่อไป

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