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Analysis of Local Rheological Properties of Crystalline Polymer by Dynamic X-ray Diffraction SHUHEI NOZAKI, Grad. Sch. Eng., Kyushu Univ., KEN KOJIO, ATSUSHI TAKAHARA, Grad. Sch. Eng., IMCE, WPI-I2CNER, Kyushu Univ., KOHKI AOYAMA, HIROYASU MASUNAGA, JASRI/SPring-8 — Polymer materials form the hierarchical structure from nanometer to micrometer scales. Since the mechanical properties are correlated with the hierarchical structure, the precise evaluation of mechanical properties considering the size of the hierarchical structure is important. Recently, the time-resolved measurement of molecular aggregation structure using microbeam have been carried out diffraction at synchrotron radiation facilities. Analyzing change of crystal structure using microbeam X-ray diffraction under cyclic dynamic strain will give rheological properties of local region of crystalline polymers. In this study, a time-resolved microbeam wide-angle X-ray diffraction was used to study local rheological properties for inside and outside of isotactic polypropylene (iPP) spherulite under cyclic dynamic strain. Local dynamic storage modulus (E) and loss modulus (E) were obtained from change of d-spacing in (110) planes of alpha form of iPP crystal for inside and outside of iPP spherulite at a condition with strain of 0.01 and 0.1 Hz. The local E values were larger than those obtained from dynamic viscoelastic property measurement. This might be due to lower modulus of amorphous phase of bulk iPP.

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