

Infrared Measurements and X-Ray and Neutron Scattering Studies of the Alkane Absorption of the Isotactic Poly(4-methyl-1-pentene) Film

Hiromi Murashige¹, Yusuke Hiejima², Yusuke Sanada³, Yukiteru Katsumoto³,
Ayano Chiba¹

¹ Graduate School of Science and Technology, Keio University, Japan

² Department of Chemical and Materials, Kanazawa University, Japan ³ Faculty of Science, Fukuoka University, Japan

Email of corresponding author: ayano@phys.keio.ac.jp

ABSTRACT: It has been reported that as-cast P4MP1 (isotactic poly(4-methyl-1-pentene)) films absorb various organic solvents such as alkanes.⁽¹⁾ In general, semi-crystalline polymers absorb solvent molecules in amorphous regions because the densities of amorphous regions are usually lower than those of crystalline regions. However, the densities of crystals and amorphous in P4MP1 are very close, and there is a possibility that the solvents could be preferentially absorbed in the crystalline region. The purpose of this study is thus to clarify which region P4MP1 absorbs the solvent preferentially.

Infrared spectroscopy (IR) results showed that the sample with low crystallinity absorbs larger amount of solvent. The wide-angle x-ray diffraction (WAXD) results suggested that the solvent was absorbed not only in the amorphous region, but in the crystalline region. The small-angle x-ray scattering (SAXS) results showed an appearance of a peak with the solvent absorption (Fig. 1). The appearance of the lamellar long-range peak shows the generation of the scattering contrast between those regions due to the solvent absorption.

It was concluded that P4MP1 as-cast films are likely to absorb the solvent in both the amorphous and crystalline regions, but the

absorption in the amorphous region is more prominent. We have also measured the selective absorption in the amorphous and crystalline regions by means of neutron scattering using deuterated reagents and the results are currently under analysis.

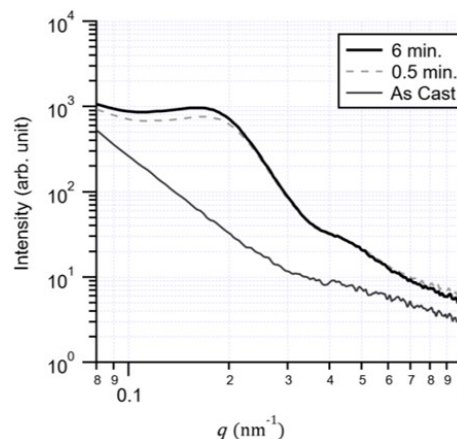


Fig. 1: SAXS profile of the as-cast P4MP1 film and its time dependence after dropping hexane on it

KEY WORDS: poly (4-methyl-1-pentene), P4MP1, alkane, SAXS, IR

References

1. A. Chiba, A. Oshima, and R. Akiyama, *Langmuir* 35, 17177 (2019).