高分子学会九州支部外国人学者講演会

Synchrotron Grazing Incidence X-Ray Scattering and Its Applications in Characterizing Nanostructures of Polymeric Nanosystems

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Ree 教授は、韓国を代表する高分子科学者で、特に放射光を利用した高分子のナノ構造の解析で世界的に著名な研究者です。佐賀シンクロトロン訪問および SAS2006（京都)、SRP-3（播磨　SPring-8）での招待講演のために来日される機会に、高分子学会九州支部主催の講演会を箱崎地区で開催いたします。多数ご出席下さいますようご案内申し上げます。

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A schematic optical setup of grazing incidence X-ray scattering (GIXS) is given and compared with that of conventional transmission X-ray scattering (TXS) in Fig. 1. Synchrotron GIXS has several important advantages over transmission X-ray and neutron scattering as well as scanning and transmission electron microscopies: (i) a highly intense scattering pattern is always obtained, even for films of nanoscale thickness as well as nanostructures on substrates, because the X-ray beam path length through the film plane is sufficiently long; (ii) there is no unfavorable scattering from the substrate on which the film is coated; and (iii) easy sample preparation [1-9]. For these advantages, in recent years the GIXS has become the major analytical tool for characterizing structures and properties of a variety of nanostructures and nanoscale thin films in a single and multilevels. However, the quantitative analysis of measured GIXS data requires developing a new proper scattering theory because of the complexity of GIXS phenomenon due to the scatterings from the transmission and reflected X-ray and the refraction effect, which is very far from the conventional transmission and reflection X-ray and neutron scattering. We have newly developed a GIXS theory and its data analysis method [1,2]. In our study GIXS measurements with synchrotron radiation sources were conducted statically and in-situ for a series of nanoscale thin films prepared from nanoporous dielectrics, block copolymers, brush polymers, and molecular assemblies (Figs. 1, 2, and 3) [1-9]. All GIXS measurements were performed at the Pohang Accelerator Laboratory (PAL) (Fig. 4) [10]. The measured scattering data were analyzed in detail by using the newly developed GIXS scattering theory. All GIXS results will be discussed in details with considering the materials chemistry and nanostructure formation process parameters. [*This study was supported by the Korea Science & Engineering Foundation (National Research Lab Program: Contract No. 2005-01385) and by the Ministry of Education (BK21 Program). Synchrotron GIXS measurements were supported by the Ministry of Science and Technology and POSCO.*]

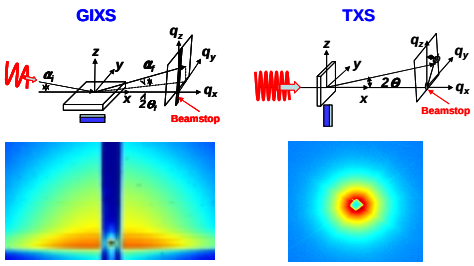

Fig. 1. Schematic diagrams of GIXS and TXS.

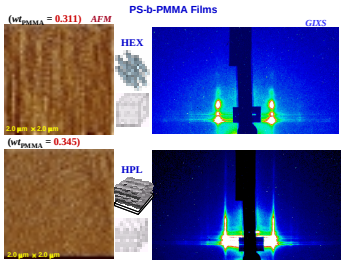

Fig. 2. AFM and GIXS results of PS-b-PMMA films.

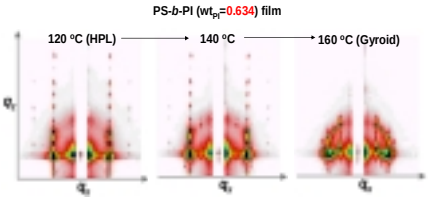

Fig. 3. Thermal phase transition of a PS-b-PI film.

Fig. 4. Synchrotron facility of Pohang Accelerator Laboraory (Pal) at Pohang University of Science & Technology (Postech)

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