

高分子学会九州支部外国人学者講演会

**HIERARCHICAL STRUCTURE FORMATION BEHAVIORS IN
NANOSCALE THIN FILMS OF LINEAR-BRUSH DIBLOCK
COPOLYMERS: A SYNCHROTRON GRAZING INCIDENCE
X-RAY SCATTERING STUDY**

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主催：高分子学会九州支部、G-COE「未来分子システム科学」

共催：九州大学シンクロトロン光利用研究センター、九州大学 高分子機能創造リサーチコア、
JST, ERATO 高原ソフト界面プロジェクト

日時：2010年3月16日（火）10:30-11:30

場所：九州大学伊都キャンパス CE40 棟 2F セミナー室

Ree 先生は、ポハン工科大学(POSTECH)教授、ポハン放射光施設(PAL)長で、高分子構造の分野で活発に研究を展開されています。Ree 教授は特に高分子組織体の微小角入射小角 X 線散乱解析で優れた研究成果を多数発表されています。この度、九州大学シンクロトロン光利用研究センター記念講演会(<http://www.rcsl.kyushu-u.ac.jp> 3/15)での招待講演のために佐賀 L S を訪問される機会に伊都地区で講演会を企画いたしました。多数ご出席下さいますようご案内申し上げます。

The morphological structures in thin films of diblock copolymers containing polyhedral oligomeric silsesquioxane (POSS) were investigated in detail by using synchrotron grazing incidence small and wide angle X-ray scattering (GISAXS and GIWAXS). In addition, its thermal properties were studied. Thin films of this diblock copolymer were found to undergo phase-separation during solvent-annealing with carbon disulfide and post thermal annealing. To quantitatively analyze the scattering data, GISAXS and GIWAXS formulas were derived and applied. Our detailed analysis found that the minor block component is induced to form in the diblock copolymer films by solvent-annealing and are hexagonally packed in the POSS containing matrix, in which the cylinders are oriented vertically with respect to the film plane. In the solvent-annealed films, both the cylinders and the PMAPOSS containing matrix are featureless, i.e., amorphous. However, the post thermal annealing process induces aggregation of the POSS moieties, which results in the formation of crystals with an orthorhombic lattice unit cell. These crystals were found to consist of POSS containing block chains in a helical conformation in which the molecular POSS containing block chain cylinders are aligned in the film plane. The formation of these crystals is induced by the ordering ability of the POSS moieties. The crystals were found to melt above 190°C during a heating run and to form again during the subsequent cooling run. In contrast, the hexagonally packed structure of the minor block component cylinders in the solvent-annealed and post thermally annealed films was found to be retained during the heating run and the subsequent cooling run. In addition, the scattering analysis provides detailed structural parameters. The two-dimensional GISAXS and GIWAXS patterns were reconstructed from the determined structural parameters by using the derived scattering formulas, and found to be in good agreement with the experimental patterns. Moreover, a model for the structure of the films of the diblock copolymer is proposed. In addition, lamellar structure systems are introduced.

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