

CHEMICAL SCIENCE

The recent beamline upgradings are accelerating an expansion of chemical science research field subject to SPring-8. In concert, the fruitful researches were carried out at the beamlines of powder diffraction, small angle scattering (SAXS) and nuclear spectroscopy, while the pilot applications of SAXS/WAXD and grazing incidence SAXS(GISAXS) measurements are making substantial progress from the viewpoint of effective utilization of potential abilities of beamlines. The research object also has wide variety in feature such as polymer morphology, thin film, catalysis, gas absorption, protein molecule reaction and etc.

In the present issue, ten topics have been chosen. The first three studies, "Study on structural change of Pd nanoparticles with hydrogen absorption/desorption process" by Hirokazu Kobayashi, Hiroshi Kitagawa *et al.*, "Guest-induced instant and reversible crystal-to-crystal transformation of 1,4-bis(ferrocenylethynyl) anthraquinone" by Hiroshi Nishihara *et al.* and "Observation of gas adsorption process on porous coordination polymer by X-ray diffraction" by Yoshiki Kubota *et al.*, describe the *in situ* observations of molecular absorption on nanoporous coordination polymers by powder diffraction. This has recently been one of the most active research subjects at BL02B2.

Polymer science is also an area of recent active research that is producing attractive results due to the upgrading of SAXS beamline BL40B2. "First direct observation of nano-nucleation by small angle scattering on polymers" by Kiyoda Okada, Masamichi Hikosaka *et al.* is the first significant approach to obtaining a fundamental understanding of the nucleation process in polymerization. "Structural model of a poly(vinyl-alcohol) film uniaxially stretched in water" by Tsukasa Miyazaki *et al.* reveals the molecular orientation behavior in a uniaxially stretched polymer film for the first time. This result is a very important industrial application developed at SPring-8 relevant to the dichromatic performance of the polarizer used for liquid crystal displays (LCD). In "Characterization and degradation behavior of segmented poly(urethaneurea)s with lysine-based diisocyanate" by Atsushi Takahara *et al.* a nano-level polymer structure is also revealed by performing an accurate SAXS experiment. The development of advanced experimental techniques for polymer structure analysis, GISAXS and SAXS/WAXD, are discussed in "In situ investigation of annealing effect on higher-order structure of polyethylene thin films by synchrotron grazing-incidence small-angle and wide-angle X-ray scattering" by Sono Sasaki *et al.* and "Structural transition of poly[(R)-3-hydroxybutyrate] single crystals on heating as revealed by SAXS and WAXD" by Masahiro Fujita, Tadahisa Iwata *et al.*, respectively. "Synchrotron radiation research for the progress of self-regenerative function to Rh-, and Pt-perovskite catalysts" by Hirohisa Tanaka and Yasuo Nishihata discusses the industrial utilization of research at SPring-8, which may contribute to economic growth. Finally, "Nuclear spectroscopy of nitrogenase and hydrogenase" by Stephen P. Cramer *et al.* outlines a promising application of nuclear resonant spectroscopy to bioscience.

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