Materials Science
Structure

The Materials Science being developed at SPring-8 has two frontiers, namely, a novel structure determination under unexplored conditions and research on a precise structure-property relationship. The variety of research is increasing following the upgrade of experimental equipments every year. Of particular importance is the progress in data accuracy brought about by a top-up mode operation and a high-pressure experimental technique.

In the present issue, concerning the accurate structure research, the precise Maximum Entropy Method (MEM) charge density study using powder diffraction data: "Accurate structure factors from synchrotron powder diffraction data at SPring-8" by Eiji Nishibori and the three-dimensional amorphous structure research using Reverse Monte Carlo method (RMC): "Structural basis for fast phase change of DVD-RAM" by Shinji Kohara are chosen. Both studies were achieved by advanced data analysis techniques such as MEM and RMC and the excellent findings resulted from reliable data generated by a well-developed experimental machine and a top-up mode operation. In addition, the elaborate work on GaAs surface structure determination using the anomalous dispersion effect, namely, "Element-specific surface X-ray diffraction study of GaAs surfaces" by Masamitsu Takahashi, is also chosen.

This year, various novel structures were discovered under high pressure and reported in specialized journals and press conferences. The present issue deals with four topics, namely, "A Cd-Yb alloy rich in order-disorder transition" by Tetsuo Watanuki, "New helical chain structure for Scandium at 240 GPa" by Yuichi Akahama, "O_8 cluster of the ε phase of solid Oxygen" by Hiroshi Fujihisa and "X-ray-induced dissociation of H_2O and formation of an O_2-H_2 compound at high pressure" by Wendy L. Mao. Among them, the quasicrystal pressure-temperature phase diagram study by T. Watanuki is quite unique and may become a key to unraveling the mystery of the nature of the quasicrystal structure.

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