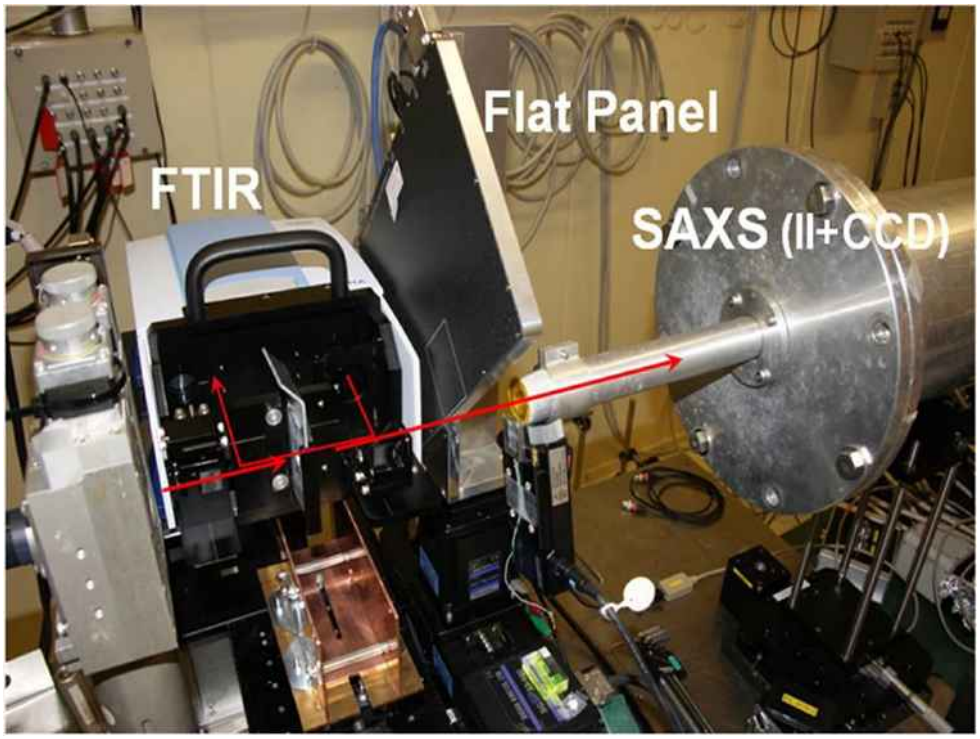
MS71.O02

Study of Phase Transition by FTIR/SAXS/WAXD Simultaneous Measurement System

K. Tashiro[1], H. Yamamoto[1], T. Yoshioka[1], D. Tahara[1]

[1]*Toyota Technological Institute, Department of Future Industry-oriented Basic Science and Materials, Nagoya, Japan*

FTIR/SAXS/WAXD simultaneous measurement system has been developed for the study of the structural phase transition behaviors of soft materials including crystalline polymers. The system consists of a transmission-type miniature FTIR spectrometer set around the sample stage and the 2-dimensional detectors for WAXD and SAXS measurements in a synchronized mode, as shown in Figure. The infrared and X-ray beams can pass through the same position of a sample, which is set on the various types of equipments such as a stretcher, a heater, a temperature-jump cell for isothermal crystallization, etc. The system has been successfully applied to the studies of the structural evolution processes of crystalline polymers. For example, an intimate relationship has been clarified between the structural change in the crystal lattice and the change in lamellar stacking mode during the stress-induced phase transition of poly(tetramethylene terephthalate). Another example is the study of phase transition of aliphatic nylons in the heating and cooling processes. So far the aliphatic nylons were considered to show the phase transition at a so-called Brill transition point, but the simultaneous measurement revealed another phase transition occurring in a temperature region immediately below the melting point. The structural evolution has been also studied for the isothermal crystallization process of crystalline polymer from the melt, as seen in the case studies of polyethylene, nylon, polyester, and so on. The concrete description was made for the regularization process viewed from the various hierarchical levels of molecular chain conformation, chain packing mode, and lamellar stacking mode or higher-order structure.



Keywords: FTIR/SAXS/WAXD Simultaneous Measurement, Phase Transitions, Polymers