

Application of SAXS, WAXS and GISAXS on materials characterization

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Small angle X-ray scattering (SAXS), wide angle X-ray scattering (WAXS) and grazing incidence small angle X-ray scattering (GISAXS) combined with a 2-dimensional semiconductor X-ray detector are powerful tools to characterize nano materials. It reveals size, shape and preferred orientation of nano objects. In the paper, it will be demonstrated how those techniques are utilized to characterize nano materials. A highly stretched polypropylene film was investigated by SAXS and WAXS. The length of the molecular chain and its lattice constants are successfully analyzed (Fig. 1). Three dimensional preferred orientation of a polymer plate was able to be determined by WAXS measurements by changing orientation of the film against incoming X-ray beam (Fig. 2). The GISAXS analyses nano particles deposited or grown on flat substrate. A pentacene thin film deposited on a silicon substrate was analyzed by GISAXS. Strong c-axis preferred orientation perpendicular to the substrate and crystal structure of the pentacene thin film was confirmed by the measurement (Fig. 3). Detailed instrument setup and analysis will also be discussed.

Keywords: thin film, nano materials, SAXS, WAXS, GISAXS

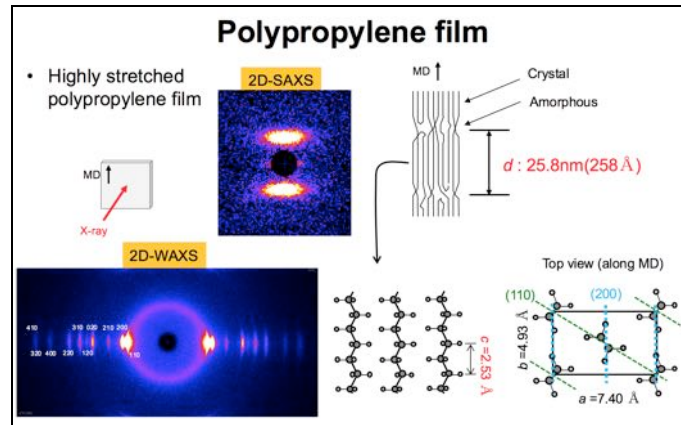


Fig. 1 SAXS and WAXS measurement results on a polypropylene film.

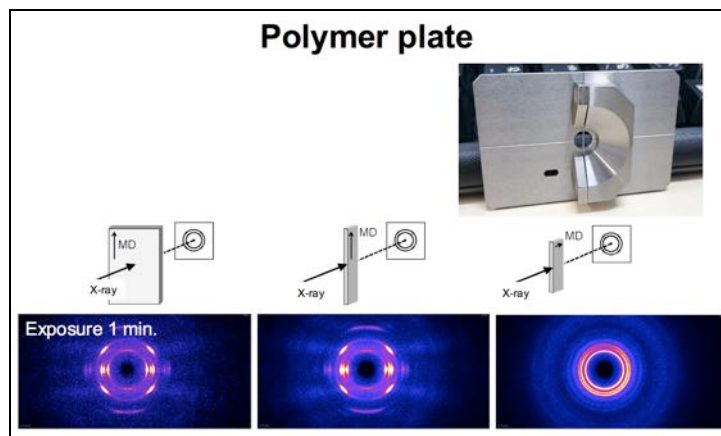


Fig. 2 WAXS measurement on a polymer plate.

GISAXS on Pentacene thin film

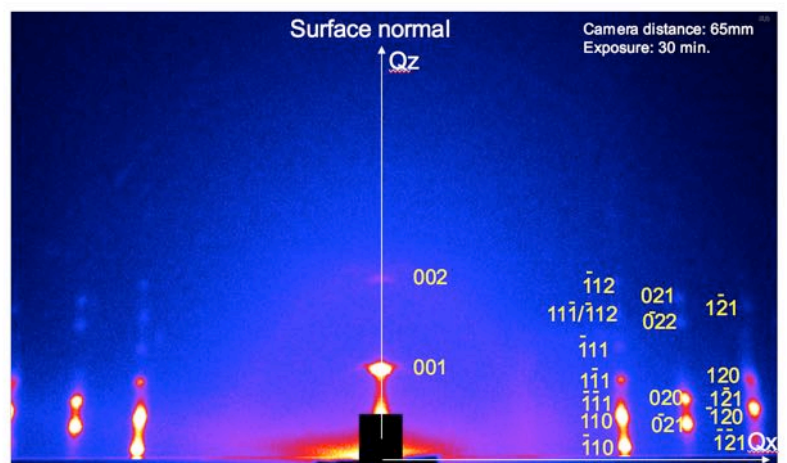


Fig. 3 GISAXS measurement on a pentacene thin film