X-RAY DIFFRACTION STUDY ON HIGHLY ORDERD MESOSTRUCTURED THIN FILMS

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A continuous mesostructured silica film with uniaxially aligned hexagonal mesochannels is obtained on a silica glass substrate using a rubbing -treated thin polyimide coating on the substrate. The mesochannels in the film are aligned perpendicular to the rubbing direction [1].
To analyze the mesostructured thin films we used a conventional line-focus x-ray diffraction and a two-dimensional(*2-D*) x-ray diffraction using a synchrotron x-ray microbeam[2].
The diffraction patterns were changed coincident with the sample ***f*** rotation, which revealed the anisotropy of the mesostructures. Though only two diffraction peaks are observed in Fig1a, and two extra peaks are appeared in Fig.1b. It was shown that these extra peaks came from the reciprocal lattice points which were not on the diffraction plane. The divergence of the x-ray beam and the uniaxial alignment of the sample made them detectable.
2-D diffraction is the best way to investigate the anisotropy of the mesostructures (Fig2), however, conventional x-ray diffraction is still useful to find out the mesochannels alignment.

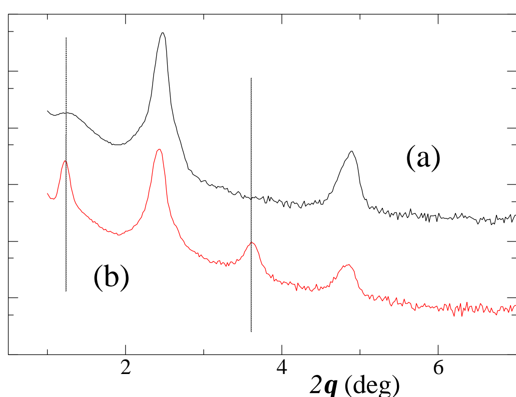

Fig.1 The conventional x-ray diffraction patterns.
(a)The line-focus of the x-ray tube is set parallel to the mesochannels.
(b)It is set perpendicular to the mesochannels.

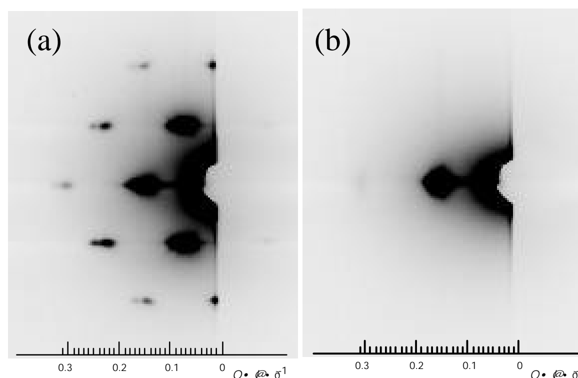

Fig.2 The *2-D* x-ray diffraction patterns obtained by using the synchrotron x rays. (a)The incident x rays are set parallel to the mesochannels.
(b)They are set perpendicular to the mesochannels.

References

[1] H. Miyata and K. Kuroda, Chem. Mater. **12** (2000) 49.

[2] T. Noma *et al*, Proceedings of SRI2000, Nucl. Instrum. Methods A, (2001) in press