Distribution analysis of hydrophilic component in polysulfone hollow fiber using scanning transmission x-ray microscope (STXM)

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Polysulfone (PSF) hollow fiber is widely used as a membrane filter in water-treatment systems, medical devices, and so on. When used for these purposes, PSF is often blended with some kinds of hydrophilic polymers in order to gain good wettability or biocompatibility. Therefore, the nanometer scale distribution of such hydrophilic component in a hollow fiber is very important. We have investigated the distribution of poly(N-vinylpyrrolidone) (PVP) in a PSF hollow fiber STXM at Advanced Light Source (ALS) beamline 5.3.2. An ultrathin section of PSF hollow fiber embedded in epoxy resin was prepared for STXM analysis. A series of mapping data (49 mappings) was obtained at the same analysis area by varying the photon energy with 0.2 eV step near the C K-edge NEXAFS region. Singular value decomposition analysis using internal (PSF and epoxy) and external (PVP) standard spectra showed clear distribution of each component. It has been clearly revealed that the PVP-rich thin layer exists on the surface of PSF. The average thickness of this PVP rich layer was measured to be 35 nm. The results will be compared with cross sectional TEM images.

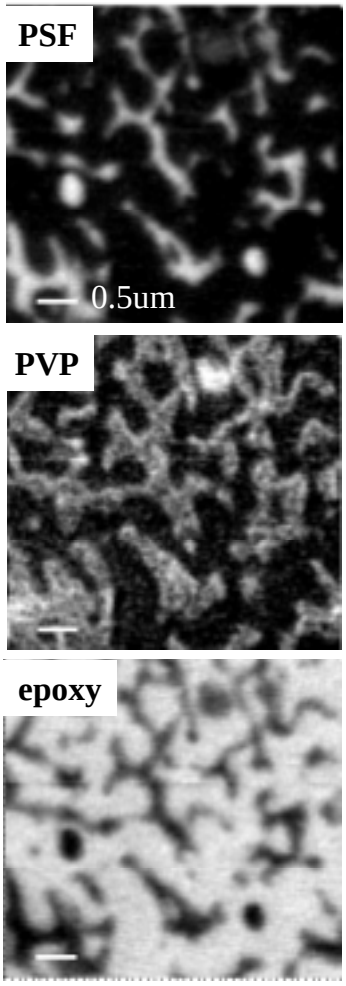

Fig.1 Distribution of each polymers at the cross section of the hollow fiber.