# Current Status of Scanning Transmission X-ray Microscopy Beamine at UVSOR

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The UVSOR facility, a 750 MeV synchrotron radiation facility in the Institute for Molecular Science (IMS, Okazaki, Japan), has been in operation since 1983. From April 2012, we started the UVSOR-III project to improve the beam emittance by optimizing eight bending magnets [1]. Along with this project, a scanning transmission X-ray microscope (STXM) beamline, BL4U, was constructed to utilize the improved ability of the UVSOR-III. The STXM is a high spatial resolution microscope (~30 nm) based on near edge X-ray absorption fine structure (NEXAFS) spectroscopy measured in transmission mode. The STXM enables to analyze 2-dimensional chemical states around a target element with high spatial resolution. Moreover, the STXM has many unique features which cannot be achieved with any other microscopic method, such as 3-dimensional observation, observation of orientations of molecules, that of the sample in water and so on. Then, to bring out satisfactory performance of the STMX, an in-vacuum undulator and a variable included angle Monk-Gillieson mounting monochromator were installed to obtain both high photon density and high energy resolving power and an interface software to integrate these equipment has been developed. Since June 2013, the commissioning was finished and our beamline has been opened to general users from domestic, abroad and companies.

As a test measurement, thin specimen of printer toner particles were observed at the oxygen K edge. A stack of 78 X-ray transmission images was acquired with the x-ray energy range from 522 to 564 eV. Then, the dwell time was 3 msec for each pixel. A spectrum of each component of the specimen, matrix, resin, and wax, is shown in Fig. 1 (a). They were extracted from the each specific region of the image stack. By fitting these spectral data to the original image stack, chemical distributions of the components are obtained. They are clearly distinguished as shown in Fig. 1 (b), (c) and (d).

We are now developing several observation methods to explore new applications in molecular science. Current status, sciences and perspective of BL4U will be discussed.

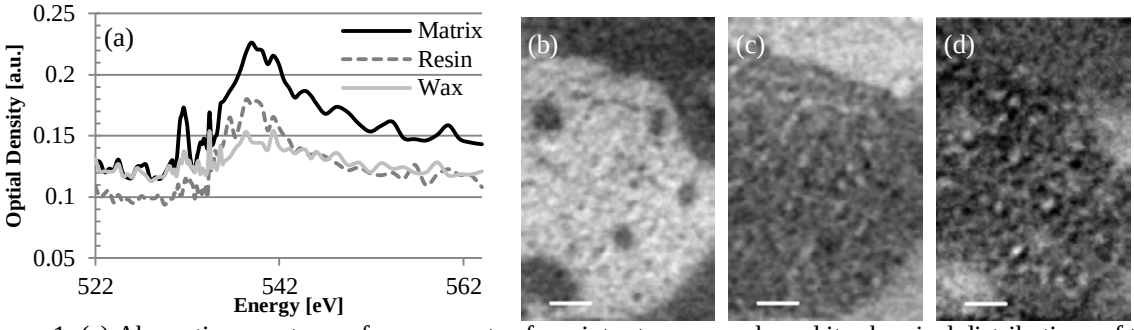


Figure 1: (a) Absorption spectrum of components of a printer toner sample and its chemical distributions of three components, (b) matrix, (c) resin and (d) wax. Higher concentrations of each component are brighter. Scale bars are 1 μm.