

Mapping very similar chemical components in micron-scale organic rods by Scanning Transmission X-ray Microscopy

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Scanning transmission X-ray microscopy (STXM) is powerful tool for analysis of organic materials because it provides two- and three-dimensional [1] chemical component mapping based on the near edge X-ray absorption fine structure (NEXAFS) spectra of the components. It is very interesting to test the capability of STXM to distinguish very similar organic components since subtle differences are often used to control materials properties. This work reports a C 1s STXM study of micro organic rods constructed from two kinds of polyester (called polyester A and B). Their chemical structure is very similar, but the function of polyester A is to form the overall shape of the rod whereas polyester B is not. Quantitative information about the overall composition and internal spatial distributions of components is very helpful in process development.

Reference spectra of the pure components and C 1s image sequences of microtomed sections of a micro organic rod were measured using the STXM at beam line 5.3.2 [2] at the Advanced Light Source. The C 1s NEXAFS of polyester A and B (**Fig. 1**) are very similar; however small but reproducible differences between 288 and 291.5 eV provide sufficient contrast for mapping. **Fig. 2** shows an optical density image at 285 eV and quantitative maps of the two polyester components of one micro organic rod section. **Fig 1** compares the C 1s spectra extracted from regions of high A and B polyesters to validate the analysis. This study has shown that STXM can provide quantitative chemical component maps even for species with very similar NEXAFS spectra, such as these two polyesters.

1) Hitchcock, A.P. et.al., J. Phys . France **104** (2003) 509-512

2) Kilcoyne, A.L.D. et.al., J.Synchrotron Rad. **10** (2003) 125-136

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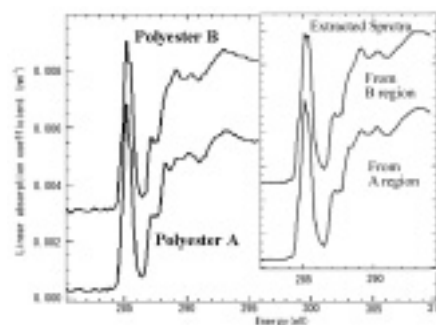


Fig 1 C 1s NEXAFS of two polyesters

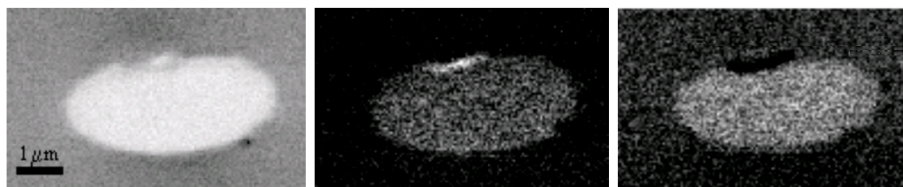


Fig. 2 (left) Optical density image at 285.1 eV. Component maps of polyester A (centre) and B (right)