

Final Report

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Enhancement of the Microscopy Facilities at the NSLS X1A Beamline

As originally proposed, we constructed a new Scanning Transmission X-ray Microscope, STXM IV. The design and construction was led by co-PI Chris Jacobsen, and involved graduate students Michael Feser, Mary Carlucci-Dayton and Tobias Beetz.

This microscope has the following new features:

- It has a new and improved high resolution scanning stage that should make it possible to perform higher resolution imaging without distortions. Preliminary results indicate that the stage performs as designed.
- It has an enclosure that can be evacuated and back filled with helium. This makes it possible to perform imaging in the neighborhood of the nitrogen and oxygen edges without interference from residual air.
- It has a motorized detector stage for easy interchange of detectors and alignment microscope. We expect to use this to align the new segmented detector which makes it possible to perform bright field and dark field microscopy simultaneously, and to record images in differential phase contrast as well.
- The microscope is located upstream of cryoSTXM, the instrument we use to examine specimens in a frozen hydrated state. The design of STXM IV is such that it makes it quick and easy to switch between STXM IV and cryo-STXM operations and vice versa.
- IEEE488 based control electronics provides multiple channels of data collection.
- The microscope is run from a LINUX PC with all new software, developed in-house.
- The stages for the zone plate and the order sorting aperture (OSA) have kinematic mounts. This way different sets of zone plates (optimized for different wavelengths and working distances) can be exchanged without the need for complete realignment of the instrument.
- The enclosure can be used as a glove-box, making it possible to examine specimens which require anaerobic handling.

The inboard branch microscope is now commissioned, and is expected to begin routine use early in the year 2000. The majority of the components for the outboard branch microscope are in-hand, but we are seeking funding for the vacuum chamber for the second microscope.

We have no objection from a patent  
standpoint to the publication or  
dissemination of this material.

*Mauro B. Diorsale* 7/21/00  
Office of Intellectual  
Property Counsel  
DOE Field Office, Chicago  
Date

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