DEMETER – Dual Electron Microscopy and Spectroscopy Beamline

Poster/Oral Presentation
Date of presentation
Time of presentation

A. Mandziak[1]*, B. Wolanin[1], K. Matlak[1] and T. Tyliszczak[1,2]

[1]*National Synchrotron Radiation Centre SOLARIS, Jagiellonian University, ul. Czerwone Maki 98,30-392 Cracow, Poland*

[2]*Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA*

*e-mail: anna.mandziak@uj.edu.pl

A new soft X-ray beamline, DEMETER , has been constructed at SOLARIS synchrotron to perform advanced soft X-ray microscopy for materials science. The beamline is designed to achieve high energy resolution (E/ΔE = 3000 - 15000) and high photon flux (10^{12} ph/s/0.01%bw) in the photon energy range 100-2000 eV with controllable polarization. The beamline is made up of two branches, each one having a microscope available: STXM (Scanning Transmission X-ray Microscopy) and X-PEEM (X-ray PhotoEmitted Electron Microscopy) with an aim to reach spatial resolution below 20 nm and to fully exploit the local spectroscopic capabilities of the two microscopes. The availability of the two methods within the same beamline will enable the users to select the appropriate approach to study their specific case in terms of sample environment, spectroscopy methods, probing depth etc.

Scanning Transmission X-ray Microscope (STXM) is placed at the end of the second branch of the beamline. It is a modern microscope designed and built at SOLARIS and allows for chemical analysis with a resolution about 20 nm, limited by available zone plates. A ptychography option with sophisticated cameras will improve a spatial resolution to below 5 nm. This branch is intended to research on chemical and structural properties, in samples which can transmit soft X-ray radiation. The microscope will be equipped with an environmental cell, where samples can be measured in different atmospheres under the pressure from 10^{-7} mbar up to 1100 mbar, variable temperature, or in liquids with full electrochemical control.

The availability of two microscopic methods within the same beamline will allow users to choose the appropriate approach to study their specific case in terms of sample environment, spectroscopy methods, probing depth, etc.

In this presentation, we show the characteristics and features of the beamline and its experimental stations. Additionally, an overview of the microscopes operation modes will be briefly presented. Finally, possible research applications are demonstrated, based on results obtained so far.