

Sector 6



Midwest Universities CAT

Overview

The Midwest Universities CAT was organized in 1990. At present, its member institutions include Ames Laboratory/Iowa State University, University of Missouri at Columbia, Georgia Institute of Technology, Washington University, University of Wisconsin at Madison, Kent State University, State University of New York at Stony Brook, Michigan State University, and the Institut für Festkörperforschung Forschungszentrum Jülich GmbH. The main undulator line of the sector features a four-circle diffractometer for single-crystal work, a liquid surface reflectometer, and a new surface science chamber. In addition, a high-energy side station (30-120 keV) is currently under construction and will run in parallel with the main undulator line [3-22 keV for Si (111) monochromating crystals].

Research Focus

Research efforts are focused in the areas of magnetic scattering and spectroscopy, as well as in resonant- and nonresonant-scattering studies of magnetic materials. The technique of circular magnetic x-ray dichroism (CMXD) offers tremendous potential as a tool for studies of the electronic states associated with magnetic order in ferromagnetic materials of fundamental and technological interest. Resonant and nonresonant magnetic x-ray scattering measurements offer important and complementary means of determining magnetic structures in materials that are ill-suited, by reasons of size or chemical composition, to traditional neutron measurements (e.g., for magnetic structure studies of metastable phases and surfaces).

Research efforts in the surface-scattering program are centered on the study of the kinetics and growth of two-dimensional systems, the role of defects in epitaxy, ordered non-epitaxial overlayers, phase transitions, and investigations of liquid surfaces. The surface chamber constructed for this sector will enable surface-scattering investigations to expand into new areas: real-time growth characterization in a variety of growth environments, low-Z adsorbate systems, and two-dimensional surface kinetics. A liquid surface diffractometer will be used to probe the chemistry and physics of monolayer films at liquid surfaces, as well as of realistic models of biological membranes.

General scattering programs include microdiffraction techniques, coherent scattering, high-temperature processing of materials, studies of liquid crystals and polymers, and strain in thin films and interfaces.

Work on the high-energy side station will include techniques such as nonresonant magnetic scattering, radial distribution function analysis of disordered and partially ordered materials, and *in situ* time-resolved measurements of high-temperature materials processing.

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