

An Applied Materials Chamber for Surface Science and Materials Science Studies

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INTRODUCTION

On the bending magnet beamline 9.3.2 [1] at the ALS is installed an Ultrahigh Vacuum Applied Materials Chamber (AMC) designed for Angle-Resolved X-ray Photoemission Spectroscopy and X-ray Absorption Spectroscopy, coupled with the circularly polarized light capability of the beamline. Since its commissioning, many outside users [2,3,4] and Berkeley Lab scientists [5] have come to utilize this system's unique versatility to achieve their diverse scientific goals.

SYSTEM CAPABILITIES

The AMC (Fig. 1) is equipped with a Physical Electronics, Inc. (PHI) Spherical Capacitor Electron Energy Analyzer with an angle-resolving Omni V lens system, variable apertures, a high-speed 16-element multi-channel detector and a high-resolution power supply. The 5-degrees-of-freedom (X, Y, Z, continuous θ and continuous ϕ) sample movements are facilitated by a state-of-the-art manipulator, which is able to cool the sample surface to 110K by liquid Nitrogen and easily heat it up to well over 2000K by electron bombardment. The chamber also has a PHI dual-anode X-ray tube for off-line XPS work, a reverse-view linear-travel LEED system for sample characterization, a PHI ion gun for sample cleaning, an Omicron Evaporator and Quartz Crystal micro Balance (QCB) for sample preparation. For absorption type experiments, we have an angle-integrated electron Partial Yield Detector (PYD) and a shielded-wire sample current collector. Recently, we have installed a differentially pumped sample transfer stage that can move samples from atmosphere into UHV on a short notice. Users routinely reconfigure some ports on the chamber to suit their different needs, e.g. add cleavers or scrapers for studies of high-Tc samples.

FURTHER IMPROVEMENTS

The analyzer power supplies are currently under a major upgrading effort. We plan to use four 18-bit Digital/Analog Converters to build a high-stability, high-resolution, fast-response power supply for the analyzer retard, lens and pass energies. A combination of this next-generation power supply and a new fast 96-element multi-channel detector (under development) will help to improve the energy resolution of the analyzer up to about 20meV.

ACKNOWLEDGMENTS

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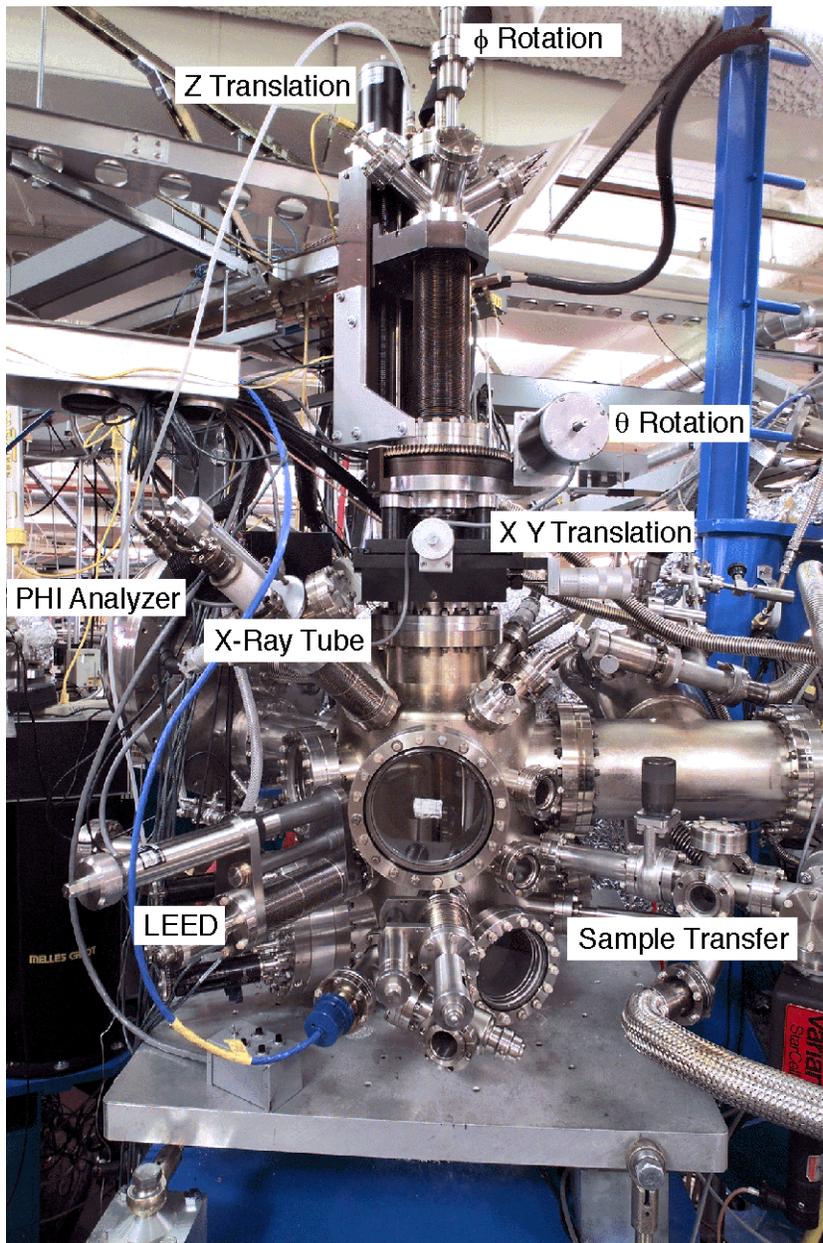


Figure 1. Photograph of the AMC.

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This system is available for use to independent investigators with arrangement.