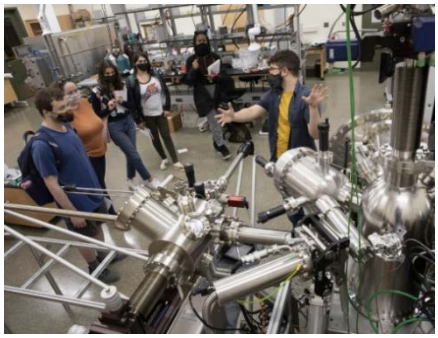
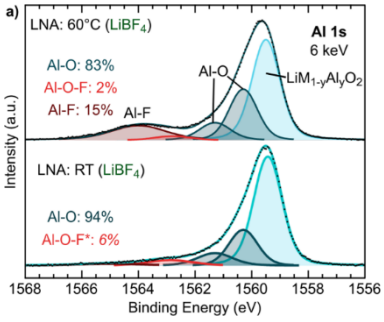
IEEE Webinar Proposal

The HAXPES-Lab: How does it work and what it can do for the electronics industry?

Abstract





Lebens-Higgins, Z.W., *et al.* *Sci Rep* **9,** 17720 (2019).

Hard X-ray Photoelectron Spectroscopy (HAXPES) is an extremely powerful analytical tool for characterizing and understanding materials. Synchrotron HAXPES typically uses a tunable, focused X-ray beam in the tender spectrum (2.0 keV to 7.5 keV) to probe the depth-dependent chemical, electronic, and molecular structure near the surface of material with a wide range of probing depths (approx. 3 to 30 nm below the surface). The spot size at the sample can be focused to as small as ~50 µm. Unfortunately, HAXPES remains a relatively unknown and often underutilized technique due to its requirement of a large synchrotron facility.

Now, recent advancements in laboratory-based X-ray generation technology have finally enabled the development of a compact, economically viable, and fully-featured laboratory-based HAXPES platform. The HAXPES-Lab, created by Scienta Omicron, utilizes the revolutionary Excillum liquid Ga MatalJet X-ray source to generate a focused ~10 keV photon beam with comparable brightness to some synchrotron sources. This high energy X-ray source provides information from as deep as 50 nm below the sample surface with a sub 50 µm spot size. With its added Al K-alpha XPS source, the HAXPES-Lab is capable of non-destructive depth profiling from the surface to the bulk of thin films, nanoparticles, and more. In addition, the HAXPES-Lab manipulator is capable of biasing devices, charge neutralization of insulators, and temperature control between ~200 – 1300 K during measurement.

In this talk, Dr. Matt Wahila will explain this useful spectroscopy technique, describe the capabilities of the new HAXPES-Lab system at Binghamton University, and provide some examples of its utility for current materials science and microelectronics research.

Biography

Dr. Matt Wahila is a research scientist and education development officer in the Analytical and Diagnostics Laboratory (ADL) at Binghamton University. In 2017 he received his PhD in Physics from Binghamton University, winning Binghamton University's 2017 Distinguished Dissertation Award in Mathematics, Physical Sciences, and Engineering for his graduate research. He then went on to work as a post-doctoral research associate on the CEREBRAL AFOSR MURI investigating novel semiconductor materials for biomimetic computing applications, before joining the ADL staff at the beginning of 2022.