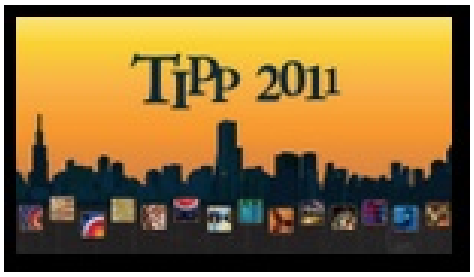

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Instrumentation for Theory-Inspired Photocathode Development within the Large Area Picosecond Photodetector (LAPPD) Project

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In a phototdetector, the photocathode is the element responsible for the conversion of the photon into an initial photoelectron. Many fundamental detector properties such as dark current, quantum efficiency, response time, and lifetime, as well as the production cost of the detection system, are determined by the properties of the cathode.

This talk will discuss instrumentation specifically designed for a theory-driven approach to the development of cost-effective large area photocathodes. We have designed and commissioned a laboratory for the growth and characterization of photocathodes at Argonne National Laboratory. The instrumentation allows the study of optical properties, electrical behavior (I/V-curves, photoconductivity), and spectral response of the cathode (quantum efficiency); the system is part of a network using various DOE user facilities allowing in-situ experiments to determine the microscopic and chemical structure of the cathode. By combining these tools we correlate the cathode's functionality with its microscopic structure. Another important aspect of this infrastructure is to bridge the gap between one-of-a-kind production and industrial manufacturing resulting in large availability for end users.

The interaction between basic sciences and implementation of the results into industrial production processes for photocathode development are well-suited to a multi-purpose National Laboratory. In the future we plan to make these tools available to the broad scientific and industrial community.

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