# Thomas Lampros

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## *A Brief History of PV, and a Look Into the Future of CIGS*


### Abstract

The photovoltaic industry has seen significant growth since its commercial beginnings in the 1950's. Technologies have advanced from silicon wafers to thin films on flexible substrates. Markets for PV have sustained a growth rate of better than 30% a year for the last 30 years. This talk will present a brief history of developments in solar cell technologies and PV markets. The focus will then shift to thin film PV, with an emphasis on the chalcopyrite compound copper indium diselenide, commonly known as CIS, and its quaternary alloy with gallium, or CuInGaSe2 (CIGS). We will present an overview of existing manufacturing technology and metrology requirements for this challenging yet promising thin film. The justification for this effort is found in a lower cost per watt ($/W) than crystalline silicon, and in the opening of markets and applications for a flexible product which previously could not be addressed by c-Si.


### Bio

Mr. Thomas M. Lampros has dedicated his professional career to the development and application of solar energy related systems for electric power generation and thermal conversion. Mr. Lampros has been the Director of Process Technology at Aventa Technologies and at Veeco Solar, where he developed processes for roll-to-roll deposition of CuInGaSe2 solar cells. He served as Senior Engineer at DayStar Technologies, where he developed a pilot line for manufacturing high efficiency, lightweight CIGS solar cells. At UD's Institute of Energy Conversion, he researched CIGS and related materials, employing vacuum and aqueous deposition processes. While employed at BP Solarex, Mr. Lampros participated in team-based research and manufacturing of a-Si solar cells and conductive tin oxide, and managed the back-end processes of module finishing and encapsulation. At AstroPower (now GE Solar), he managed the concentrator solar cell program, specializing in 10-100x point- and linear-focus Si and GaAs cells using surface- and buried-contacts. He also pioneered characterization and fabrication techniques for AP's Si-Film cells. Prior to his involvement with photovoltaics, Mr. Lampros was the Operations Manager for Energy Marketing Group, a manufacturer and installer of solar hot-air collectors, where he began as an installer.

Mr. Lampros received an M.S. in Materials Science from the University of Delaware in 2000 while employed at IEC, a B.S. in Engineering Physics and an A.A.S. in Mechanical Technology, both from S.U.N.Y. at Buffalo. While at UB, he founded a chapter of the L-5 Society. He has served the solar industry as a NYSEIA Board Member, and as a Delaware Valley Regional Representative to NESEA. He is a member of IEEE, NYSEIA, NESEA and ASES.