

Title: Compound Semiconductor and InP-Based Solar Cells

Course Description /Abstract: Photovoltaics (PV) technology is currently enjoying substantial growth and investment. While III-V compound semiconductors are a small part of the photovoltaics market, currently they are undergoing rapid growth, largely due to record photovoltaic conversion efficiencies for compound semiconductor multijunction solar cells and new technologies for concentrator photovoltaics. This course will introduce the space and terrestrial photovoltaics markets, solar cell fundamentals, and will survey the technology for compound semiconductor solar cells. We will discuss detailed balance and carrier transport-based models for multijunction solar cells, lattice-matched and metamorphic epitaxial growth approaches for III-V compound semiconductor multijunction cells, concentrator photovoltaic systems and avenues for cost reduction in compound semiconductor photovoltaics.

Intended Audience: MS/Ph.D. students and researchers of M.S. or Ph.D. level education active in semiconductor research.

Biography: Harry Atwater is the Howard Hughes Professor and Professor of Applied Physics and Materials Science at the California Institute of Technology. His research interests center around two intertwined research themes photovoltaics and renewable energy and plasmonics and optical metamaterials. Atwater and his group have been active in photovoltaics research for more than 20 years. Recently they have pioneered new fabrication approaches to III-V semiconductor multijunction cells, and have active research projects on silicon nanorod array solar cells, III-V thin film cells, silicon thin film cells and plasmonic light absorber structures. Atwater received his S.B. (1981), S.M. (1983), and Ph.D. (1987) in Electrical Engineering from the Massachusetts Institute of Technology. He currently serves as Director of the Caltech Center for Sustainable Energy Research(www.ccser.caltech.edu), and also as Director of Caltech's Center for Science and Engineering of Materials (an NSF MRSEC); www.csem.caltech.edu. Professor Atwater has consulted extensively for industry and government, and has actively served the materials community in various capacities; he is founder and chief technical advisor for Alta Devices, a solar energy company in Santa Clara, CA.