

UNH Materials Science Seminar

11:10-12:00, Thursday, April 19, 2007

Murkland Hall 202

University of New Hampshire

Atmospheric Pressure Plasma CVD of Silicon Nitride Films for Solar Cells

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This talk will discuss the results of research collaboration between the University of New Hampshire and GT Solar, Inc. to design and develop an atmospheric pressure plasma process to deposit silicon nitride thin films on solar cells. The silicon nitride serves as an anti-reflection and passivation layer, and is currently deposited by various low pressure plasma techniques which are batch-type, require cumbersome vacuum equipment, and limit throughput. A simpler, continuous, fast throughput, non-vacuum deposition process is critical for the solar cell industry to meet upcoming high growth and low cost goals. A large reactor that can handle 4 inch square, multi-crystalline silicon solar cell wafers has been designed and fabricated. Atmospheric pressure plasma is achieved using a dielectric barrier discharge. Preliminary tests have been performed using this reactor, and the system demonstrates a stable and uniform plasma with different gas mixtures, including argon, ammonia, ammonia and hydrogen and silane. Silicon nitride films are being deposited under a various reaction parameters, including frequency, relative flow rates of silane and ammonia, power, and gap distance between electrodes. The silicon nitride thin films properties will be described based on x-ray photoelectron spectroscopy, scanning electron microscopy, and infrared spectroscopy. Additionally, interesting facts about solar energy and the photovoltaics industry will be presented.