

Graduate Student Seminar

The Structure of Disordered Silicon: A Proton's Perspective

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Disordered silicon is emerging as the premier material for use in photovoltaic devices. To produce device quality films, it is necessary to incorporate ~10 atomic percent Hydrogen into the lattice during the growth process. The Hydrogen atoms relax the inherently strained lattice by terminating otherwise dangling silicon-bonding sites. But there is a caveat. Hydrogen dynamics, caused by exposure to light, causes a semi-reversible degradation of the film quality. Such an effect is detrimental for the ultimate utility of amorphous silicon in photovoltaic applications.

It has long been thought that the degradation problem originates from a re-ordering of Hydrogen bonding environments upon "light soaking". Using proton magnetic resonance techniques, we are able to probe the bonding sites before and after degradation. Recent measurements have provided a direct link between a paired Hydrogen site and the metastability. In this talk, a survey of the bonding neighborhoods, and how they are deduced from magnetic resonance data, will be discussed. Come, listen, and contribute your thoughts to this thirty-year-old problem!

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