MSE 520: SEMINAR SERIES

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Light Induced Degradation of Silicon Solar Cells, A Materials Mystery

TCrystalline silicon solar cells, the primary photovoltaic technology, suffer from a mysterious problem. When exposed to light, their performance can degrade substantially (10% or more), due apparently to a reduction in carrier lifetime. The phenomena is associated with residual oxygen and boron doping, but with a contradictory dependence on doping. The first mystery is why should light exposure at room temperature affect lifetime in the first place? Light induced degradation (LID) initially seemed to correlate with B concentration, but then when P counterdoping was added it appeared that it was actually the hole concentration that mattered (but B had to be present). But wait, changing the hole concentration by co-doping with Ga doesn't significantly change LID. These mysteries and more will be explored and explained by careful examination of the crime scene (experimental observations) combined with detailed analysis back in the lab (fundamental calculations of the energetics of defects and complexes that might be present).

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Scott Dunham was born in 1958 in Brattleboro, Vermont. He received a B.S. in Electrical Engineering from Cornell University in 1979, and M.S. and Ph.D. degrees in Electrical Engineering from Stanford University in 1980 and 1985. He was a faculty member in the Electrical and Computer Engineering Department at Boston University from 1985 to 1999. In 1999, he joined the Electrical Engineering Department at the University of Washington. He is also an adjunct faculty member in Materials Science and Engineering. His research is focused on the modeling of microfabrication processes and device behavior.

Scott Dunham is a member of the IEEE Electron Devices Society, the Materials Research Society, The American Physical Society and the Electrochemical Society. He is currently Associate Editor for Diffusion and Silicon Processing for the Journal of Electronic Materials. He is also a member of the Front End Processes (FEP) Technical Working Group for the International Technology Roadmap for Semiconductors (ITRS'99).

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