Old Dominion University
Department of Physics

Colloquium

Tuesday, January 23, 2018

" Grain and Grain Boundary Engineering for High Efficiency $Cu(In,Ga)Se_2$ Solar Cells"

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Abstract: As world energy demands continue to increase, the need to generate electricity from a broader variety of sources, including renewables, is more important than ever. With costs still 30% higher than those of natural gas, solar energy is a viable contender but more progress is needed to level the playing field with other forms of energy generation. Among the cost drivers that could allow for manufacturing price reductions, high efficiency is critical. In the case of $Cu(In,Ga)Se_2$ solar cells, one of the most prominent polycrystalline thin film solar cells on the market, generating high efficiencies involves engineering both the grains and the grain boundaries, and therefore produces specific requirements. Among those are managing (i) the composition of all elements in the quaternary alloy and the phases in presence, (ii) the deposition process to allow for maximum grain growth and band gap engineering, and (iii) the diffusion of specific impurities for passivation of the grain boundaries. Solutions to these problems, involving synergistic fabrication, characterization and modeling, will be presented and include a multi-step deposition process, controlled gallium content grading for the absorber layer, enhanced in-situ monitoring (by real time spectroscopic ellipsometry), and newly developed alkaline post-deposition treatments. By modifying the deposition process, and engineering both the grain and grain boundary, we will show how the fine-tuning of the $Cu(In,Ga)Se_2$ material properties can lead to enhance solar cell efficiency.

Presentation: OCNPS 200 @ 3:00 pm
Refreshments: OCNPS Atrium @ 2:30 pm

All interested persons are cordially invited to attend.