Excitonics/Perovskite SEMINAR SERIES

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Perovskite Tandems: A Path Towards Stable 27% Efficiencies*

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Hybrid lead halide perovskites are promising candidates for low cost, thin film light absorbers; they have a tunable band gap and have demonstrated efficiencies as high as 22.1%. As such, these materials are of interest for wide-bandgap absorbers in tandem photovoltaics. Hybrid lead halide perovskites are soft materials with rough surfaces and are sensitive to temperature and oxidative conditions, making many deposition processes incompatible with this material. Typical perovskite solar cells employ spin-deposited organic selective transport layers and evaporated metal contacts on top of the perovskite absorber. These organic selective transport layers have a few main drawbacks for tandem solar cells: first, the rough perovskite surface requires thick organic layers for complete coverage, resulting in significant optical losses, second, these organic materials are incompatible with the types of sputter processes used to deposit high quality transparent contacts (such as indium-tin oxide) and third, organic materials are typically poor elemental diffusion barriers; such barriers are important for device stability. We applied tin oxide by atomic layer deposition (ALD) as a dual-purpose layer to achieve electron selectivity and sputter protection with high optical transmission in monolithic perovskite/silicon and perovskite/perovskite tandem devices.

Axel Palmstrom is a graduate student at Stanford University pursuing his Ph.D. in Chemical Engineering. His work focuses on the study metal oxide thin films grown by atomic layer deposition for applications in thin film photovoltaics, including electron and hole selective layers, barrier layers and surface passivation.

This talk is part of the Perovskites Seminar Series organized by Juan-Pablo Correa-Baena from MIT's PV Lab and sponsored by the Center for Excitonics. For more info contact Juan-Pablo: jpcorrea@mit.edu