Abstract Submitted
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The effect of electron extraction layers on the excitonic properties of hybrid perovskite thin films[1] KATERINA NIKOLAIDOU, SOM SARANG, DENZAL MARTIN, VINCENT TUNG, JENNIFER LU, SAYANTANI GHOSH, University of California Merced — Optimum interaction between light harvesting media and electron extraction layers is critical for the efficient operation of photovoltaic devices. In this work, we study the effect that various morphologies of ZnO substrates have on the excitonic properties of hybrid perovskite (PVSK) thin films. The ZnO susbtrates employed include single crystalline (SC), micro-structured (MS), and nano-structured (NS) ZnO. Characterization of the PVSK/ZnO interface is achieved via electron microscopy, as well as temperature, power, and time-resolved photoluminescence (PL) spectroscopy to probe interfacial charge transfer. We observe that SC-ZnO acts as an effective electron extraction layer as indicated by PL quenching, reduced recombination lifetime and reduced exciton density in the PVSK thin film. However, MS- and NS-ZnO demonstrate PL enhancement, while reducing recombination lifetime. These results vary with temperature and can be correlated with variations in exciton binding energy of PVSK, underlining the effect of the electron extraction layer on the excitonic properties of the PVSK film. We conclude that while SC-ZnO can be used for electron extraction in photovoltaic devices, MS- and NS-ZnO can be implemented as scaffold in optical devices that require high quantum yield.

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Katerina Nikolaidou
University of California Merced

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