

PHYSICS & ASTRONOMY SEMINAR

“Thin Film All Back Contact Perovskite Photovoltaics”

Presented by:
Matthew Sibila

Abstract: Photovoltaic (PV) devices based on perovskite absorbers have achieved > 25% power conversion efficiency (PCE) in traditional solar cell architectures at laboratory scale sizes of approximately 0.1 cm². However, conventional designs are known to suffer from instability and the need for high-cost organic transparent conductors. All back contact thin-film PV devices avoid the need for transparent contacts and reduce shadow losses associated with grid contacts. They also provide greater flexibility for applications such as building integrated PV. In this work we investigate all back contact (ABC) thin-film perovskite device designs with both contacts placed on the rear (non-illuminated) side. After giving background information on perovskite materials, we present the advantages of ABC perovskite devices over their traditional counterparts and the effects of putting both contacts on the back. Current ABC perovskite devices have a PCE of ~10% compared to traditional architectures' PCE >25%. The challenges that need to be overcome for back contact PVs to match their traditional counterparts are production difficulty, prevalence of surface defects, and device integration technology being underdeveloped. We present the work done so far to increase understanding of these devices. Numerical models based on the semiconductor transport equations quantify how passivation of surface and interface recombination can significantly improve performance. We also show the effects of photolithography, transport layer modification, use of anti-reflective coating, and modification of device architecture on device properties.

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“The Study of Variable Stars in Globular Cluster M5”

Presented by:
Bo Royer

Abstract: Globular cluster M5 (NGC 5904), located in the constellation *Serpens*, was discovered over 300 years ago. Since then, several studies have sought to characterize and understand its origin and evolution. Of particular interest are the studies involving the cluster's variable star population. To date over one hundred variable stars have been identified in the cluster. The majority of these are short period variable stars belonging to the category “RR Lyrae”. With advances in photometry and automated observation, recent studies have begun to investigate the cluster's population of long period variable stars (LPV's), but further study is needed to fully catalog and characterize them. Seven of the sixteen known LPV's in M5 do have undetermined periods, and more are awaiting discovery. This talk will cover some of the characteristics of M5, and discuss the importance of further study.

Presentation of the Overman Undergrad Awards and Bowman Family Undergrad Research Awards

Thursday, April 8, 2021

4:00 pm

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