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Progress in Halide Perovskite Solar Cells: Insights on active layers and interfaces relating to stability

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Monday, April 16th at 4:00 p.m.
120 Engineering (Hammond Auditorium)

Abstract

Photovoltaic devices based on hybrid organic-inorganic perovskite absorbers have reached outstanding performance over the past few years, surpassing power conversion efficiency of over 22%. This talk we discuss recent progress and challenges in hybrid perovskite solar cells with an emphasis on the role of the interface in device performance including stability. An examination of different perovskite active layers and interfacial electronic structure of these remarkable materials will be presented. Our studies at NREL indicate interface formation of the active layer with different carrier transport materials has direct implications for performance and it evolution over time in the resulting devices. Interface studies using surface science tools that provide insight into the character of these interfaces and identification of charge transfer mechanisms across the interface with chemical specificity will be touched upon to provide insight into the requirements for realizing high performance devices. Findings from these are combined with time resolved spectroscopy, structural studies and device level studies to validate impacts on carrier dynamics and demonstrate their technological relevance of interfacial insights will also be discussed to provide context for more recent studies examining cell level stability of these devices.

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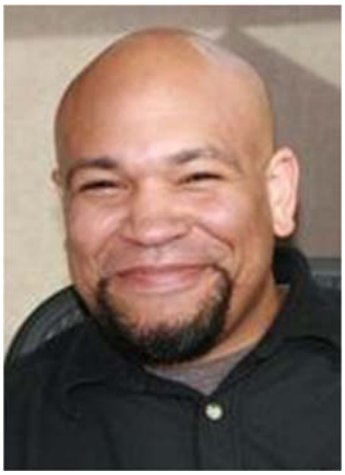
Biography



Dr. Berry is currently the team lead for the National Center for Photovoltaic's halide perovskite solar cell program. He is a graduate of the Penn State Department of Physics, receiving his PhD for work on spin physics of magnetic II-VI, III-V and metallic/semiconductor systems. After his PhD work he was awarded a National Research Council Fellowship at the National Institute of Standards and Technology (NIST/JILA), where he worked on the development and application of high-resolution spectroscopic techniques to solid-state electro-optical systems. Since joining NREL he has worked on a range of next generation photovoltaic materials and devices with an emphasis on relating basic interfacial properties to device level performance. He has worked on these issues in several Energy Frontier Research Centers (EFRCs) to connect basic science developments in these areas to technological applications, but in less traditional compound semiconductor systems such as oxides and organics. His research interests have led to his current work as team lead on the metal-halide perovskite solar cells.