Unraveling Kinetics at the Nanoscale: 
Defect Engineering of Thin Film Solar Absorbers 
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Abstract: High conversion efficiency and long device lifetimes require exercising nanoscale control over the material’s microstructure and composition as well as transport across device interfaces throughout multiple length scales. For decades we have focused on pushing technique’s resolution close to the physical limits, almost to the point where it has become commoditized. While high resolution is necessary to develop emerging energy materials, multimodality sensing and functionality are univocally more valuable. This presentation will cover recent results in the polycrystalline CuInGaSe₂ system and show that the key lies in the multimodal evaluation of the device under operating conditions and the kinetics that govern compositional inhomogeneities. Integrating and synthesizing correlative information is something our brain performs seamlessly every second of the day from information gathered by our senses from our “operating” environment. In the field of energy conversion technology the confluence of state-of-the-art characterization approaches and advanced computing will enable us to emulate this highly efficient process at unimaginable speeds, thus allowing us to design next generation materials and devices.

Bio: Mariana Bertoni received her PhD from Northwestern University in 2007 in Materials Science and Engineering with a minor in Chemistry. She joined Arizona State University as an Assistant Professor in 2012. Prior to this, she held senior scientist positions at two emerging start-up firms in the photovoltaic industry and a visiting scientist appointment at the Massachusetts Institute of Technology (2010-2012). Her previous postgraduate experience includes a postdoctoral appointment at the Massachusetts Institute of Technology (2008-2010), a Marie Curie postdoctoral fellowship at Creavis Technologies & Innovation in Germany (2007-2008) and a visiting researcher appointment at the National Renewable Energy Laboratory. She has published over 60 research articles in peer-reviewed journals, and presented more than 120 papers at scientific meetings. She has received multiple awards and recognitions, including most recently selection to the National Academy of Engineering 2017 US Frontiers of Engineering and Arizona State University’s 2016 Outstanding Assistant Professor. She currently serves at the Advanced Photon Source MBA upgrade user board and is active in various committees and chairing positions at the IEEE photovoltaic specialists conferences.
TOP-SET is a training program that aims to form a cohort of highly qualified personnel with comprehensive understanding of optoelectronic systems, capable of joining advanced R&D teams. For further details regarding TOP-SET, go to create-topset.eecs.uottawa.ca.

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