NORTHWESTERN UNIVERSITY'S DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING AND MATERIALS RESEARCH SCIENCE AND ENGINEERING CENTER PRESENT:

2022 MSE FUTURE LEADERS SEMINAR SERIES

Rhiannon Kennard

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Dr. Rhiannon Kennard obtained a Master's degree in Materials Chemistry from University of California, San Diego, where she fabricated and characterized porous silicon for battery and sensing applications. Following this, she completed her PhD Materials Science in the group of Prof. Michael Chabinyc at the University of California, Santa Barbara. During this time, she investigated the structural, ionic, mechanical and optical properties of halide perovskite films. In October 2021, Rhiannon moved to the group of Prof. Serena Cussen at the University of Sheffield, where she synthesizes novel cathodes for sodium batteries using sustainable methods. Rhiannon is also a co-organizer of the Next Generation Solar Energy (NGSE) PhD-Postdoc series, and a co-organizer for nanoGE meetings on halide perovskites.

Using Chemistry and Strain to Tune the Emission Color of 2D Perovskite Films

Halide perovskites are being commercialized as solar cells, and are attractive for light emission, photodetection, and photocatalysis. Two-dimensional (2D) perovskites are particularly interesting, as they exhibit many different types of photoluminescence emission, which renders their emission color tunable across the visible spectrum. Because most devices rely on thin films, there have been extensive investigations into film growth of 2D perovskites. The most common method for film growth is solution processing, but this presents major challenges: the perovskite phase, domain size, and crystallite orientation are all difficult to control.

In this talk, I will show how chemistry and strain dictate the phase distribution, crystallite orientation, and domain size of 2D perovskite thin films. Ion size determines which phases are most stable, and therefore most likely to form. Interestingly, the right combination of organic cation and solvent produces the desired phase, but the resulting material is missing one specific emission feature. Increasing the kinetics of growth imparts mechanical strain on the 2D phase, which weakens a different emission feature. Thus, film growth parameters can be used to tune the optoelectronic properties of 2D phases in ways not available to bulk powder synthesis, which is currently the most common method for identifying new properties. Slight changes to precursor solution chemistry also produce thin films with large domain size and homogeneous crystallite orientation. Consequently, these films have low electronic disorder near the absorbance onset, which is highly desirable for photovoltaics or photodetectors.

Thursday, June 9 • 10 AM CDT • Zoom Link

Meeting ID: 958 6172 3631 • Password: mse_FLS

Questions? Contact Elena.Lindstrom@northwestern.edu

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