Abstract Submitted
for the CUWIP22 Meeting of
The American Physical Society

What is the origin of optical emission in Cs2TiBr6?[1] EMMA BURTON, Department of Physics, Goshen College, EMMA PELLERIN, Department of Chemistry and Biochemistry, Worcester Polytechnic Institute, MARANDA ALLEN, CAROLINE JAEGER, ERIKA COLIN-ULLOA, Department of Physics, Worcester Polytechnic Institute, JULIA MARTIN, Department of Chemistry and Biochemistry, Worcester Polytechnic Institute, LYUBOV V. TITOVA, Department of Physics, Worcester Polytechnic Institute, RONALD L. GRIMM, Department of Chemistry and Biochemistry, Worcester Polytechnic Institute — Thin-film perovskite solar cells (PSCs) now rival established Si photovoltaics in efficiencies and could be less expensive with fewer resources required for processing. A major drawback of the leading PSCs is the presence of Pb in their structure, raising concerns about toxicity. Cs2TiBr6 is a leading candidate of Pb-free perovskites. It has a suitable band gap to be the top absorber in tandem-junction photovoltaics at ˜1.8 eV, and Cs2TiBr6-based PSCs have demonstrated efficiencies up to 3.3%. However, a complete view of the optical properties, carrier dynamics, and environmental stability remains incomplete.

Herein, we use time-resolved photoluminescence spectroscopy to investigate optical emission and carrier lifetime in both large-grain and thin-film Cs2TiBr6 under different environmental conditions. Cs2TiBr6 demonstrates high stability in an N2 with photoexcited radiative lifetimes on the order of 0.5 ns, sufficient for photovoltaic consideration. We investigate the origins of several prominent emission features and their dependence of sample morphology as well as on environmental conditions.

[1]NSF REU Grant 1852447, David LePre Fellowship (WPI Chemistry Biochem.)

Emma Burton
Goshen College

Date submitted: 11 Jan 2022 Electronic form version 1.4