Faculty of Engineering  
Summer Research Program 2021-2022  
Project Title: Infrared Emitting Bi-perovskite Nanocrystals  
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Objective

The goal of this project is to expand on the existing knowledge around doped bi-perovskite nanocrystals to demonstrate high efficiency light emission within the infrared. To achieve this, in this exciting project you will learn how to synthesise perovskite nanocrystals and understand the role that composition and synthetic variations have on the light emission properties. In doing so, you will be able to optimise the reaction system to push the limit of these materials in terms of their light emission, ideally realising high photoluminescence in the infrared.

Project Details

Interested in research that looks at new materials and applications? Want to engage with industry and develop an academic network? If yes, then this project might be just for you!

Hybrid lead perovskite nanocrystals have emerged as a standout candidate for next-generation optoelectronic devices by possessing nearly 100% photoluminescence quantum yields, colour tunability across the visible spectrum and ease of synthesis. However, these nanocrystals contain lead and exhibit poor stability, making their widespread adoption questionable. As an alternative, bi-perovskite systems have emerged in the form of Cs2AgBiX6 (X = Cl-, Br-). Such perovskite structures are inherently more stable, but are indirect semiconductors, making their photoluminescent yields comparatively low. The doping of these bi-perovskite structures has recently been demonstrated to improve upon this limitation, which includes the ability to induce infrared light emission through the inclusion of lanthanide species.

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Any synthetic successes will be further explored within the ARC Centre of Excellence in Exciton Science, with a particular focus on novel security features with the Reserve Bank of Australia.

![Optical Analysis](image)

**Figure.** Tunable light emission properties provided by metal halide perovskite nanocrystals.

**Prerequisites**

Desire to learn new things, be challenged, have a passion for energy, and work within a team. Synthetic background stemming from an undergraduate in Materials, Chemistry or Chemical Engineering.