

S E M I N A R

A Gentle Introduction to Experimental Semiconductor Physics

The principles of novel low-dimensional semiconductors and the experiments through which they are probed

Ms Jo-Marie Rossouw (University of the Western Cape)

Friday, 12 June 2026 @ 14h00-15h00 SAST

Venues: NITheCS Seminar Room, Stellenbosch University; and Online

ABSTRACT:

The electronic band structure of semiconductors gives rise to their optoelectronic properties and forms the basis of most modern technologies. This has resulted in semiconductors becoming an integral part of the global economy and the advancement of humanity as a whole. We are constantly pushing the boundaries of technological innovation, but conventional semiconductors are struggling to keep up. The past few decades have therefore seen a surge in the amount of research conducted on novel semiconductors.

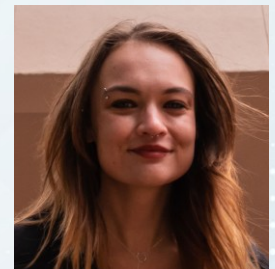
Two-dimensional hybrid organic–inorganic halide perovskites (2D HOIPs) are one such class of semiconductors. 2D HOIPs have unique crystal structures and fascinating optoelectronic properties that make them excellent contenders for the realization of the next generation of quantum technologies. However, our limited understanding of the fundamental interactions driving these properties hinders the development of perovskite-based devices. As such, tremendous efforts have been made to find a theoretical framework capable of explaining the lattice–carrier interactions and accurately predicting how they manifest physically.

In this talk, we will introduce 2D HOIPs and familiarise ourselves with their crystallographic and electronic structures. We will then explore the charge-carrying transport mechanisms and electron–lattice couplings that occur in these systems. Finally, we will examine the experimental techniques that have enabled us to probe these phenomena accurately and explore how they can be used to complement first-principles methods and develop a comprehensive theoretical model of 2D HOIPs.

BIOGRAPHY:

Jo-Marie Rossouw is in the final year of her Masters in Nanophysics in the Nanoscience Postgraduate Programme at the University of the Western Cape. She is completing her thesis under the co-supervision of Prof F. Cummings and Prof C. Arendse.

Her research is a first-principles investigation into the structural and excitonic properties of 2D HOIPs and contributes to the body of work of the Low-Dimensional Materials Group.



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