

2D dichalcogenide electronic materials and devices

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The discovery of graphene marked the start of research in 2D electronic materials which was expanded in new directions with MoS₂ and other layered semiconducting materials. They have a wide range of promising potential applications, including those in digital electronics, optoelectronics and flexible devices. Combining 2D materials in heterostructures can increase their reach even further.

In my talk, I will review the status of our research in 2D transition metal dichalcogenides (TMDCs) and present our current level of understanding on the influence of contacts, material quality and the environmental effects on 2D materials, all critical for achieving high performance levels in devices based on 2D semiconductors. I will also update on our efforts to achieve high operation frequencies in scaled TMDC devices. Next, I will show our work on atomically thin rhenium disulphide (ReS₂) liquid-electrolyte gated transistors with atypical behaviour at high charge densities related to the peculiar band structure of this material. Finally, I will present our recent work on electromechanical response of MoS₂ and graphene.