

CENIDE & WIN Seminar Series on 2D-MATURE

DFG IRTG 2803 & NSERC CREATE



Thomas Szkopek

McGill University

**“Graphene - a journey from fundamental science
to technological application”**

October 29, 2026

10:00 a.m. ET / 03:00 p.m. CET

Thomas Szkopek, professor of Electrical Engineering, Louis-Ho Faculty Scholar in Technological Innovation and associate member of the Institut Courtois, joined McGill University in 2006 following the completion of his PhD under the supervision of Eli Yablonovitch at UCLA. He has been a visiting researcher at Université de Montréal, Technische Universität Wien, Scuola Normale Pisa and Universität zu Köln. He has made contributions to the science and application of graphene, graphene derivatives, black phosphorus, and other low-dimensional systems. His recent fundamental work includes the observation of the Lifshitz transition in the electronic conduction of monolayer graphene, wherein a sufficiently high level of electron doping leads to hole conduction. He has contributed to advanced materials technology development and commercialization for over a decade.

The physical and chemical properties of graphene have been the subject of intense study for over two decades, and continue to surprise. Over this time, numerous technological applications have been proposed, but few have been developed to the point of realization and deployment. I will describe several directions of graphene research and the progress made towards technological application.

First, I will discuss the visco-elastic properties of macroscopic, free-standing graphene oxide (GO). These properties enable ultra-thin wall hollow GO spheres to remain stable in ambient conditions. Thick GO membranes can be applied to, and are ideally suited for, high-fidelity acoustic transduction. GO membranes have thus been successfully commercialized in circumaural headphones now on the market. I will share observations about the journey from laboratory science to technology.

Second, I will describe the application of wafer-scale graphene transistors to sensors for ion concentration measurement. A fundamental challenge is the robust immobilization of surface functional groups to enable selective binding of target analytes, while maintaining the electronic conduction of graphene that is necessary for high sensitivity. Conventional covalent attachment strategies disrupt the π - π^* electronic bands, introducing strong charge carrier scattering and loss of conduction. New approaches to overcome this challenge include the adoption of wafer-scale bilayer graphene and divalent attachment chemistry. Experiments towards realizing these solutions will be discussed.