# CENIDE & WIN Seminar Series on 2D-MATURE

DFG IRTG 2803 & NSERC CREATE

## Dominik P.J. Barz

Queen's University

## "Graphene-based Nanomaterials for Application in Batteries and Supercapacitors"

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10:00 a.m. ET / 16:00 p.m. CET

Dr.-Ing. Dominik P.J. Barz, PEng is currently an Associate Professor at the Department of Chemical Engineering, Queen's University at Kingston, Canada.
After vocational training as a construction mechanic, he studied Mechanical Engineering at Aachen University of Applied Science, Germany and graduated with a Diplom-Ingenieur FH (BEng) in 1996. He then held several positions in industry and public sector companies in Germany such as a lab engineer at the FHTG-Mercedes Benz Fuel Cell Lab and as a Senior Research Engineer working on Lab-on-a-Chip technologies at Forschungszentrum Karlsruhe GmbH. During these full-time employments, he pursued further (part-time) studies and graduated with a Diplom-Ingenieur (BSc + MSc) with distinction in Process Engineering from University of Technology TU Dresden and as a Doktor-Ingenieur (Doctor of Engineering Science) with distinction in Mechanical Engineering from Fridericiana University of Karlsruhe (now Karlsruhe Institute of Technology KIT). From 2007 - 2008, he was a visiting fellow at Cornell University, US working with Prof. Paul Steen on interface and transport phenomena. In 2010, he joined Queen's University as a faculty and took up the post of an Associate Director of the Queen's-RMC Fuel Cell Research Centre.
He is the recipient of several prestigious awards including a Helmholtz Association Microsystems Scholarship, the ASME ICNMM outstanding leadership award, Ontario Early Researcher Award, a DAAD Research Scholarship, and the Queen's Faculty of Engineering and Applied Science Excellence in Research Award. During 2016 - 2017, he was awarded an Alexander-von-Humboldt Research Fellowship that he spent with Prof. Steffen Hardt at the Centre of Smart Interfaces, TU Darmstadt, Germany. He has authored more than 50 peer-reviewed publications and has been given more than 50 invited presentations at conferences, workshops, and university seminars. His current research interests comprise electrochemical, interface and materials engineering with an emphasis on utilizing graphene in supercapacitors and batteries.

Graphene is a two-dimensional (2D) and 1 molecule layer thick assembly of carbon atoms in a honeycomb lattice with several outstanding properties such as a high specific surface area of 2630 $m^2/g$, Young's modulus and fracture strength of respectively 1 TPa and 130 GPa, electron carrier mobility above 200,000 $cm^2/(V\ s)$ and a thermal conductivity of 5000 W/(m K). Graphene nanoplatelets (GNP) are few or multi-layer graphene with thickness of 0.34 - 100 nm formed through the thermal or mechanical exfoliation of graphite. GNP possesses similar characteristics to graphene but tends to be more cost-effective, making it a promising candidate for use in in energy storage devices, such as batteries, supercapacitors, and battery-supercapacitor hybrids. In this talk, we review our activities to utilize graphene for different energy storage systems. In detail, we discuss printing and self-assembly of graphene electrodes for flexible supercapacitors, the doping of graphene with

heteroatoms to increase the performance of vanadium based-hybrids, as well as how doped graphene electrodes increase and considerable extend the performance of Zinc-Iodine batteries.