GTEP Grand Technion Energy Program
תכנית האנרגיה ע"ש גרנד

Faculty of Mechanical Engineering
הפקולטה להנדסת מכונות

Technion Israel Institute of Technology

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Ekaterina Pomerantseva is an Associate Professor of Materials Science and Engineering at Drexel University. She received a B.S. degree in Materials Science in 2000 and M.S. degree in Chemistry and Materials Science in 2003 from Lomonosov Moscow State University, a M.S. degree in Biochemistry in 2005 from McGill University, and a Ph.D. degree in Solid-State Chemistry in 2007 from Lomonosov Moscow State University. Prior to joining Drexel, she held postdoctoral appointments in the Institute for Systems Research at the University of Maryland College Park (2010 – 2013) and the Department of Chemistry at the University of Waterloo (2009 – 2010). She has co-authored over 75 journal papers. In 2018, she was selected to receive a prestigious NSF CAREER award. She is Scialog Fellow and Stein Fellow. Since 2018, she is a senior investigator member of the m2M Center for Mesoscale Transport Properties, a U.S. Department of Energy, Office of Science funded Energy Frontiers Research Center. Her research interests lie in the discovery and development of new solutions and next generation systems for sustainable energy and clean environment, with the focus on materials chemistry and electrochemistry as it relates to energy storage and water treatment. She leads Material Electrochemistry Group, members of which design and apply chemical synthesis methods to obtain materials with the desired structure and advanced electrochemical properties, bridging the gap between chemistry and materials science. Her group develops chemical pathways that can be used to realize materials with tunable structures and compositions that exhibit high affinity towards ions in solutions, rapid electron and ion transport, and enhanced electrochemical stability. These properties are needed to realize electrochemically-driven energy storage and water purification devices with high performance.

Will lecture on:

Tunnel and Layered Intercalation Compounds for Water Desalination via Hybrid Capacitive Deionization

With increase in the world's population and climate change, the importance of and demand for the water desalination systems continue to grow. Liquid surface freshwater constitutes only ~0.5% of the water available on Earth, and thus, desalination of brackish and saline water is becoming increasingly important as the water crisis escalates. An emerging method, hybrid capacitive deionization (HCDI), is a derivative of capacitive deionization (CDI) approach for water desalination, in which one carbon electrode is replaced with a redox-active intercalation electrode, resulting in substantial improvements in ion removal capacity over traditional CDI. However in order to keep pace with rising levels of water consumption, the performance of HCDI systems needs to be improved while maintaining low cost and minimizing environmental impact. As a result, novel scalable and cost-efficient materials that exhibit superior performance are sought for.

In this talk, I will present salt removal performance of layered and tunnel intercalation compounds. I will show that inexpensive and environmentally friendly manganese oxides can exhibit high ion removal capacities in an HCDI configuration and highlight the importance of understanding the relationships between material crystal structure, size of the ion in solution, structural/compositional dynamics and stability in electrochemical water desalination. I will also touch on extending the developed approaches to evaluating desalination performance of new materials, such as transition metal carbides (MXenes). Finally, the effect of operating conditions and intercalation compound electrode parameters on desalination performance of HCDI systems will be discussed.

Monday, March 7th, 2022, 11:00am
Wolfson Department of Chemical Engineering
Lecture Hall 1, 2nd floor
Technion City, Haifa
Zoom: https://technion.zoom.us/j/91225993763