Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3427** Type: **Invited Speaker / Conférencier(ère) invité(e)**

(I) High Performance Nano-Engineered Ion-Exchange Membranes for Clean Energy Systems

Thursday 9 June 2022 09:45 (30 minutes)

The increasing energy demand and global climate change entails for designing next-generation clean energy technologies. It is critical to address increasing global concerns pertaining decarbonization of economy and development of clean and sustainable energy conversion and storage technologies using advanced materials. Many types of clean energy storage and conversion systems are still emerging technologies, and these will continue to be part of extensive research over the next twenty years due to the increasing demand of clean energy and challenges in the existing technologies. Moreover, to focus on newly emerging applications, such as wearable electronics and powering electric vehicles, advanced materials with superior multifunctional capabilities that enable high performance, durability and lightweight designs for robust and flexible energy storage and conversion devices are highly demanded. For realizing this, serious efforts need to be undertaken to improve the performance of the electrodes and designing novel solid-state electrolytes by engineering multifunctional materials to achieve significantly improved capacity, high-rate capability, enhanced safety, and longer life cycle.

We designed and created high performance solid-state electrolytes by nanoengineering a special class of layered materials using novel technology for scalable production. These electrolytes are electrochemically stable, highly conductive, and mechanically robust, which provide specific ion conduction for various types of ions, including protons, hydroxides, and lithium ions. The strategy of synthesizing solutions for creating the chemical structure of ion exchange membranes (IEMs) is using advanced functional two-dimensional (2D) nanomaterials which provide requisite properties to the final structure of IEMs. The casted IEMs exhibit outstanding ion transport performance and cross the threshold of benchmark IEMs, conventionally used in the electrochemical energy storage and conversion industry such as fuel cells, electrolyzers, batteries, and supercapacitors.

Authors: Prof. ZARRIN, Hadis (Ryerson University); Prof. KAUR, Jasneet (Brock University)

Presenter: Prof. KAUR, Jasneet (Brock University)

Session Classification: R1-7 Materials for Energy Applications (DCMMP) | Matériaux pour applications en énergie (DPMCM)

Track Classification: Technical Sessions / Sessions techniques: Condensed Matter and Materials Physics / Physique de la matière condensée et matériaux (DCMMP-DPMCM)