

# PHYSICAL CHEMISTRY SEMINAR



## Prof. Jagjit Nanda

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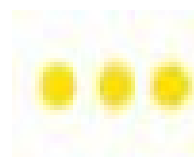
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Monday, March 6, 2023

4:00 PM | YH 4222

Mani L. Bhaumik Collaboratory -  
 Dongwon Yoo Seminar & Conference Hall

## Next Generation Solid-Electrolytes and Cathode Design for All Solid-State Batteries



**Abstract:** Lithium-metal based solid-state batteries (SSB) are considered to be the holy-grail of the next generation battery technology for their promise of higher energy density (500 Wh/Kg), safety and providing a flexible platform for integrating a number of promising solid-electrolytes (SE) with high capacity cathodes using either a thin lithium metal or anode free configuration. The design rule for achieving high energy and fast charge SSB will be discussed with specific focus on sulfide and halide based solid-electrolytes. Most of the sulfide-based SE compositions such as  $\text{Li}_3\text{PS}_4$  and Argyrodite ( $\text{LiPS}_5\text{X}$ ;  $\text{X} = \text{Cl}, \text{Br}$ ) are thermodynamically unstable against high voltage cathodes such as NMC and hence are not best catholyte for solid-state cathodes. On the contrary, halide SEs have higher oxidative stability but poor stability with respect to Li-metal. The talk will also cover development of thin SE membranes (50 micron) for integration with cathodes and development of Na-ion based SE.