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Biographical information:

Sangryun Kim received his Ph.D. from the Tokyo Institute of Technology and subsequently served as an Assistant Professor at Tohoku University. He is currently an Associate Professor at the Gwangju Institute of Science and Technology (GIST), Republic of Korea. His research focuses on the structure, reaction mechanisms, and materials design for electrochemical energy storage devices, with a particular emphasis on solid electrolytes and all solid-state batteries.

Title: Hydride-based ionic conductors for rechargeable batteries

Abstract

Ionic conduction is a key reaction of all solid-state rechargeable batteries. In this seminar, I will first introduce the fundamental principles governing ionic conduction and discuss design strategies for achieving superionic-conducting solid electrolytes. This section will provide a foundational understanding of superionic conduction, highlighting key materials and their applications in battery technology. In particular, I will explain how the crystal structures factors such as atom position, occupancy, and defect chemistry influence ionic transport.

Next, I will present complex hydrides as superionic conductors for all solid-state batteries. In the first part, I will introduce ionic conduction designs focusing on disorder (free rotation) of covalently-bonding complex anions. The second part discusses the detailed conduction mechanisms of complex hydrides, including how the disordered structure is stabilized at room temperature and how it enables the superionic conduction. In the final part, applications of complex hydride superionic conductors to the solid electrolytes will be introduced, along with promising potentials towards all solid-state batteries.