MSE-Colloquium@NTU

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Lecture Theatre 8, Nanyang Technological University, Singapore

Novel Approaches in Emerging Rechargeable Batteries

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Abstract

Two topics in emerging rechargeable battery technology will be discussed. First on the supramolecular binder designs for high capacity Si anodes. Polymeric binder has turned out to be very critical for stable operation of Si anodes, as the binder could stabilize the electrode films even during the large volume change of active materials. Recent studies in Dr Jang's lab have identified unique binder designs focusing on supramolecular chemistries, including 1) the use of mussel-inspired catechol functional group, 2) self-healing polymer network, 3) molecular machine-based polymers. The series of these investigations suggest the usefulness of noncovalent polymer interactions and the future role of supramolecular chemistry in the binder development.

Next will be the new approach of engaging intercalated water in layered cathode materials. The intercalated water improves the performance of the given materials substantially by shielding electrostatic interactions or maintaining the crystal frameworks over repeated cycles. Detailed effects of intercalated water will also be described, along with promising potentials towards aqueous operations. Electron microscopy characterization for in-depth understanding of these materials will also be introduced.

Biography

Dr Jang Wook Choi is a Professor in the School of Chemical and Biological Engineering at Seoul National University, Republic of Korea. His research interest spans from fundamental materials study to technological application in energy storage.

After completing his BS degree in School of Chemical and Biological Engineering at Seoul National University in 2002, Dr Choi received his PhD degree from Caltech in 2007, in the area of molecular electronics and electrochemistry under the supervision of Profs Jim Heath and Fraser Stoddart. He commenced his postdoctoral research at Stanford University from 2008 to 2010, in the field of lithium-ion batteries, under the supervision of Prof Yi Cui. He then conducted his independent research at Korea Advanced Institute of Science and Technology (KAIST) from 2010 prior to his move to Seoul National University in 2017.

He has received prestigious awards in recognition of innovative achievements including Hong Jinki Creative Man Award, Young Scientist Award from the President of Korea, and Creative Knowledge Award from the Ministry of Science, ICT, and Future Planning. He was also selected as a highly cited researcher by Clarivate Analytics in 2017 and 2018.

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