
TCSUH Special Seminar

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Room 102, Houston Science Center

10:00 a.m. – 11:00 a.m.

High-Capacity Concentration Gradient Cathode for Next-Generation Electric Vehicles

ABSTRACT: The ability of Li-ion batteries (LIBs) to provide portable high-density energy sources with outstanding cycle life has led to their deployment in recent electric vehicles (EVs). For wider consumer acceptance of EVs, however, the current state-of-the-art LIBs face formidable technological challenges, including concerns related to the battery cost, durability, and driving range. Resolving these hurdles requires substantial improvements in energy density, cycle life, and safety of current LIBs. Compared to the most widely accepted anode, graphite, cathodes suffer from inferior capacity, poor cycle life, thermal characteristics, and high cost. As a result, high-energy cathodes enabling a long cycle life and reliable safety need to be developed. Among them, a compositionally graded cathode material in which concentrations of the transition metals continuously varied from the particle center to the surface appears to be the most promising since the graded cathodes have demonstrated remarkable improvements over cathodes with single uniform composition, not only in lifetime and safety, but also in battery power due to the superior Li^+ diffusion kinetics. In this presentation, we review the most recent and promising results concerning NCA and NCM cathode materials. In addition, we introduce various compositionally graded cathodes and suggest the cathodes can enable production of batteries that meet the demanding performance and safety requirements of electric vehicles.

BIO: Prof. Sun earned his M.S. (1987) and Ph.D. (1992) degrees in Chemical Engineering from Seoul National University, Republic of Korea. He was Senior Visiting Scientist at Argonne National Lab from 2008-2013, and former director of the Korean Electrochemical Society. He is a member of the Korean Academy of Science and Technology, The National Academy of Engineering of Korea, and Senior Editor of ACS Energy Letters. He was formerly editor of J. of Power Sources. His research interests include electrode materials for Li-ion batteries, high-rate Li-ion battery chemistry for electric vehicles, lithium sulfur and lithium air batteries, electrode materials for Na-ion secondary batteries, and Li-Metal ion batteries. He has published 566 papers and holds 412 international and domestic patents. He is a multi-year Highly Cited Researcher, Clarivate Analytics, and has won many international awards, including the R&D 100 Award, R&D Magazine; Creative Knowledge Awards, Ministry of Science, ICT, and Future Planning; and the Technology Award, Battery Division of the Electrochemical Society.

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