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Recent Progress in Phosphate Glassy Electrolytes for Solid-State Lithium-Ion Batteries

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All-solid-state lithium-ion batteries (ASSLIBs) have drawn considerable interest as potential replacements for traditional liquid electrolyte batteries, offering advantages such as improved safety, higher energy density, and extended cycle life. Despite these benefits, significant obstacles remain to their large-scale commercialization, particularly in the development of efficient solid electrolytes. Among the promising options, phosphate glassy electrolytes stand out due to their high lithium-ion conductivity, chemical stability, and compatibility with lithium metal anodes. This article reviews our prior research on phosphate glassy electrolytes for ASSLIBs, emphasizing strategies to address critical industry challenges. It covers various aspects, including synthesis techniques, structural characteristics, and electrochemical performance, with a focus on improving ionic conductivity, mechanical strength, and interfacial stability. Additionally, it examines the incorporation of phosphate glassy electrolytes into ASSLIB designs and their interaction with different cathode materials. Finally, the study highlights future research prospects and the potential applications of phosphate glassy electrolytes in next-generation lithium-ion battery systems, emphasizing their pivotal role in overcoming current limitations and advancing safer, more efficient energy storage technologies.

Biography:

Dr. Hicham Es-Soufi is a Professor at the National Higher School of Chemistry (NHSC) at Ibn Tofail University in Kenitra, Morocco. He has previously served as the Director of Studies and Professor at the Higher School of Engineering, ESGCNT, in Meknès, Morocco. Dr. Es-Soufi is an active member of the editorial boards of four international scientific journals and has contributed as a peer reviewer for over 45 international journals.

His research focuses on the development of innovative materials, with a strong emphasis on the physical-chemistry of materials for applications in electrochemical and electrostatic energy storage, wastewater treatment, corrosion prevention, and gamma radiation shielding. Dr. Es-Soufi has published more than 50 papers in renowned international scientific journals, reflecting his significant contributions to the field.