

## Special Issue

# Digital Twin-Driven Multi-Physics and Nano/Microstructural Analysis for Lithium-Ion and All-Solid-State Batteries: Design, Optimization, and Lifetime Prediction

### Message from the Guest Editor

The ever-increasing demand for advanced energy storage solutions, in electric vehicles, grid-scale storage, and portable electronics, drives continuous innovation in battery technology. While Lithium-ion batteries (LIBs) have significantly transformed numerous sectors, the ongoing pursuit of superior energy density, faster charging capabilities, enhanced safety, and extended cycle life remains critical. Next-generation chemistries, such as all-solid-state batteries (ASSBs), offer immense promise but are confronted with substantial scientific and engineering complexities. The intricate interplay of electrochemical, thermal, mechanical, and microstructural phenomena, combined with progressive degradation mechanisms, poses considerable challenges for effective design, precise performance forecasting, and reliable lifetime estimation. Traditional empirical approaches are often insufficient, necessitating advanced computational tools that integrate data-driven and physics-based modeling to accelerate battery research and development.

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### Guest Editor

Dr. Joonam Park  
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### Deadline for manuscript submissions

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## Batteries

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