16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics

July 21-26, 2024, Vancouver Convention Centre, Vancouver, British Columbia, Canada

BATTERY MODELING AND COMPUTATION: FROM MATERIAL TO DEVICE

Jun Xu[*1] and Bin Li[2] and Chao Hu[3] and Xiang Gao[1]*

[1]*University of Delaware*
[2]*Iowa State University*
[3]*University of Connecticut*

MINISYMPOSIUM

In the relentless pursuit of energy efficiency, sustainability, and the electrification of various sectors, energy storage systems, particularly batteries, have emerged as the linchpin of modern technological advancements. The pivotal role of batteries in powering electric vehicles, renewable energy integration, portable electronics, and grid stabilization underscores the imperative for comprehensive understanding and accurate modeling of their complicated multiphysics behavior. As we stand at the precipice of a transformative era in energy storage, the need for sophisticated, physics-based models and advanced computational techniques at various length scales to predict, optimize, and control battery performance has never been more pressing.

Our objective is to explore and promote the development of models that go beyond empirical approximations, delving into the intricate electrochemical processes within batteries. These models should encapsulate the physical and chemical phenomena governing energy storage and release, accounting for factors such as electrode kinetics, electrolyte behavior, thermal effects, and structural changes. Through this conference, we hope to facilitate knowledge exchange, collaborative research, and the dissemination of novel computational tools that enable accurate battery performance predictions, state-of-health monitoring, remaining useful life prediction, and the design of sustainable, long-lasting energy storage solutions.

This symposium seeks to provide a prominent platform for researchers, engineers, and industry experts to convene and deliberate on the latest developments, challenges, and breakthroughs in battery modeling and computational methodologies. With a keen emphasis on physics-based and data-driven approaches, this symposium aims to bridge the gap between fundamental electrochemical principles and practical battery applications. By fostering an interdisciplinary dialogue among experts from various domains, including materials science, chemistry, physics, electrical engineering, and computer science, we endeavor to accelerate the pace of innovation in battery technology. We cordially invite researchers, practitioners, and enthusiasts to participate actively in this stimulating intellectual exchange. Together, let us harness the power of physics-based battery modeling and computation to shape a more sustainable, efficient, and electrified world.