



University of Hawai'i at Mānoa

Hawai'i Natural Energy Institute

School of Ocean & Earth Science & Technology

From Testing to Simulation of Commercial Lithium Ion Batteries

Lithium ion batteries have overtaken nickel-metal hydride batteries as the choice of battery for many applications in recent years due to their higher specific energy, power capability, better charge retention, and potentially cheaper costs. Nevertheless, they still face several technical challenges, such as safety, calendar life, etc, which need to be overcome before they can achieve a major penetration as a power source for electric and hybrid vehicle applications. Lithium ion batteries differ from nickel-metal hydride or lead acid batteries in many aspects, leading to difficulties in managing their performance in a long term, especially in a battery pack that can be used in electric and hybrid vehicles (typically working in a demand of 300 V and 250 A, which requires thousands of cells linked together).

In our lab, we are particularly interested in battery life prediction, which broadly touches every aspect of battery performance issues. Any practical battery life prediction tool is expected to apply to real-life operations. In this presentation, the engagement from commercial cell testing to data analysis, model construction, and performance simulation will be discussed. The attempt to apply battery life prediction in real-life will be presented. One key element to enable accurate life prediction is to understand a battery's degradation mechanism, which relies on a correct analysis of the degradation behavior. The likelihood of applying the cell model to a battery pack will be proposed as well.

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