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Designing long-life lithium-ion cells

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ABSTRACT

Rechargeable lithium-ion cells constitute the main power source of modern consumer electronics and are being increasingly considered for space satellites, medical devices, and distributed energy storage applications. Extensive materials research is being conducted at Argonne to extend Li-ion battery technology to hybrid electric vehicles (HEVs), plug-in HEVs, and battery electric vehicles, wherein the challenge is to achieve extended driving range (i.e., high energy), high charge/discharge rates (i.e., high power), and long calendar life (i.e., high stability) in a safe and cost-efficient manner. Various lithium-ion battery chemistries, including negative electrodes with various graphite morphologies, positive electrodes containing layered- and spinal-oxides, and electrolytes containing various salts and additives are being examined at Argonne as part of the U.S. Department of Energy's Advanced Battery Research program. This presentation will identify mechanistic phenomena responsible for cell performance and performance degradation and describe strategies to design safe, long-life, lithium-ion batteries.