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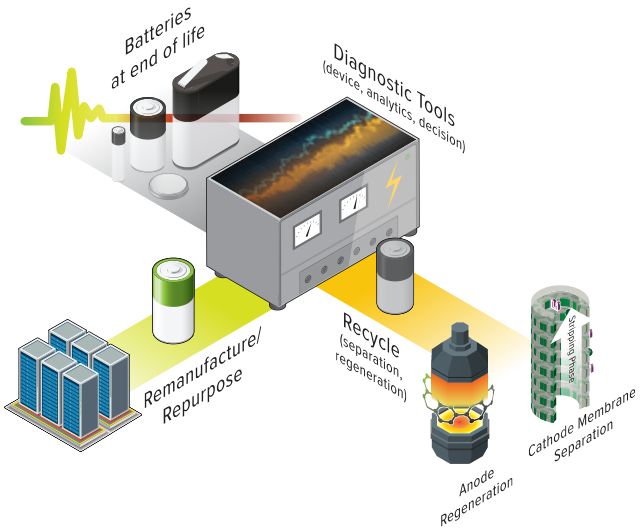
END-OF-LIFE LITHIUM-ION BATTERY OPTIONS

Remanufacturing, repurposing and recycling



The NRC's project team consists of senior researchers who specialize in mineral processing, hydrometallurgy, membrane technology, process modelling, techno-economic and life cycle analyses, battery grade natural graphite synthesis, battery prototyping to validate battery performance, electrochemical diagnosis of battery state of health, and battery performance evaluation.

RESPONSIBLE MANAGEMENT OF CRITICAL MATERIALS

As the use of lithium-ion batteries continues to grow in a wide range of applications including portable electronics, electric vehicles, and stationary storage, so does the looming environmental challenge associated with their end of life. This is because, at present, the recycling of constituent materials is fairly restricted, with a limited amount being recycled, and the majority, including some environmentally hazardous materials, being disposed of in landfills.

Current remanufacturing and repurposing technologies are mainly limited to demonstrations, while recycling technologies mainly focus on mechanical separation of the battery, plastic component removal, and separating contacts to recycle copper and aluminum, or pyrometallurgy processes, which tend to remove many valuable materials during the process.

OUR APPROACH

The objectives of this project are to develop testing standards and diagnostic tools for the remanufacturing/repurposing of end-of-life batteries, investigate the potential for direct anode regeneration, develop novel elemental separation techniques of anode and cathode materials, and understand the economic and environmental impact of recycling. The project will do this by testing, screening and selecting cells according to novel state-of-health evaluation techniques, and then build prototype remanufactured and repurposed battery sub-modules for performance evaluation.

The project will also investigate anode regeneration through thermal and chemical techniques as well as cathode recycling using a new aqueous elemental separation technology utilizing supported liquid membranes (SLM). We expect that this project will contribute to more efforts to develop efficient and cost-effective methods to recycle the increasing volume of lithium-ion batteries worldwide.

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