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Sustainable Recycling of Lithium-ion Batteries

Lithium-ion batteries power much of today's technology, but their growing use brings serious environmental and ethical concerns. These include limited supplies of key materials like lithium, pollution from mining, and unsafe working conditions. Recycling these batteries offers a promising way to reduce the need for new raw materials and lessen the environmental burden. Current recycling methods—such as high-temperature processing, chemical extraction, and newer techniques like using microbes or directly reusing parts—show potential, but they still face big challenges in cost, safety, and scaling up. This presentation takes a close look at these methods to see if they're moving beyond small improvements and toward truly sustainable solutions. By focusing on efficiency, environmental impact, and how easily these methods can be expanded, we point to the urgent need for a big-picture approach. This includes considering every battery part, using eco-friendly chemistry, and connecting science, industry, and policy. Moving in this direction is key to building a circular economy and making battery use cleaner and more responsible. In my presentation, I would like to show how we aim to advance the recycling of LIBs in the future through new methods that align with the *12 Principles of Green Chemistry*, and provide an overview of what future recycling processes could look like.

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