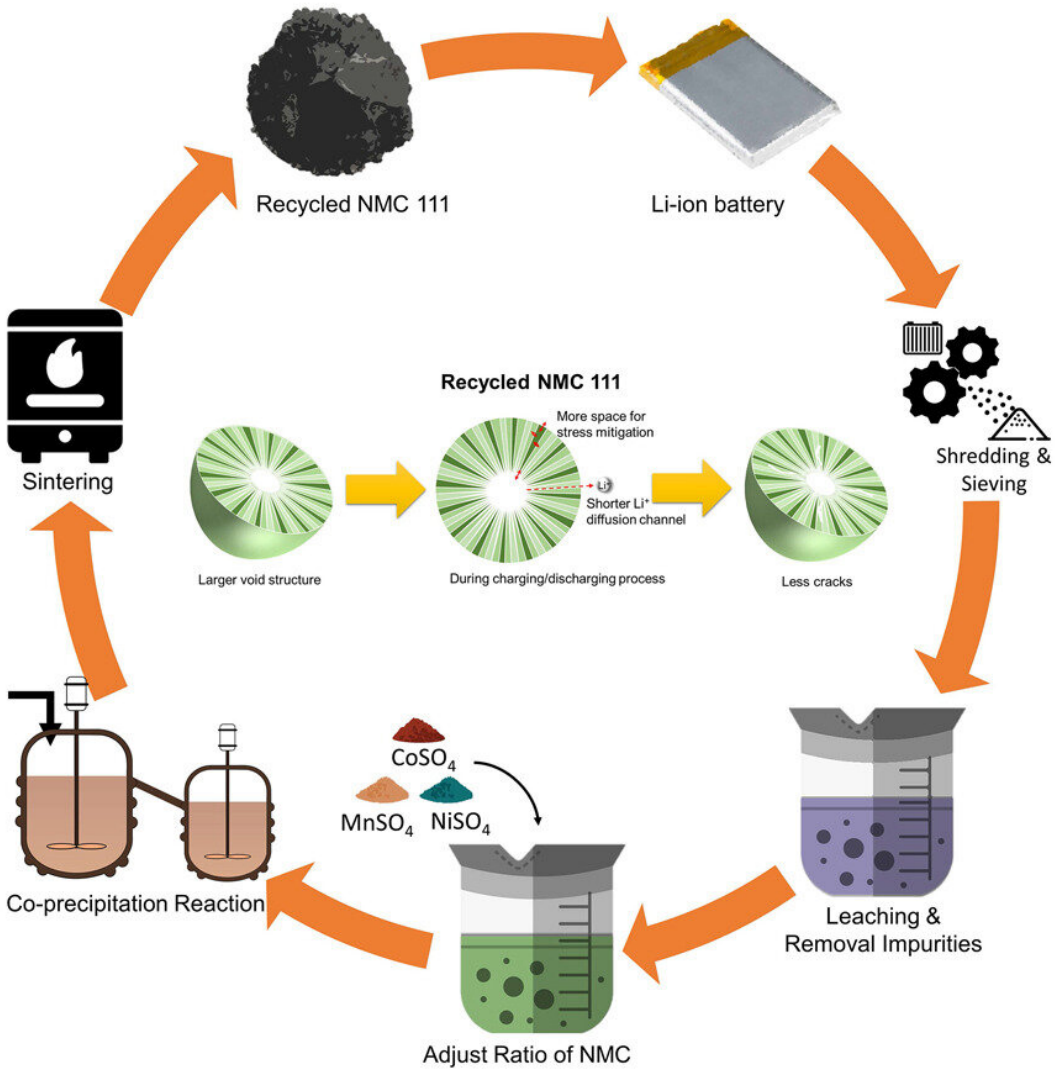
A new way to reclaim cathode materials used in lithium batteries for use in new batteries

November 5 2021, by Bob Yirka



Graphical abstract. Credit: DOI: 10.1016/j.joule.2021.09.005

A combined team of researchers from the U.S. Advanced Battery Consortium (USABC) and battery maker A123 Systems has developed a new way to reclaim some of the materials from the cathodes that are used in lithium batteries, which can then be used to make new batteries. In their paper published in the journal *Joule*, the group claims the process can be used to make new batteries that are more efficient than batteries made with newly mined metals.

Currently, very few new batteries are made using materials recycled from old batteries—instead, old, dead batteries wind up in landfills and new batteries are made using fresh materials. In this new study, the researchers have found that it is possible to use at least some of the materials in old batteries to make new ones. They have developed a recycling system that can remove the metals used in the cathodes of lithium batteries, specifically the metals—nickel, manganese and cobalt.

The technique begins with discharging the batteries. Next, the batteries are shredded and sent through a sieve where materials from the case, wires, plastics and other parts of the battery are removed. The resulting mixture holds cathode materials, other metals and some graphite. These materials are separated using both filtering and leaching. The output is nickel, manganese and cobalt in powder form. The researchers note that the powders can be used to create new cathodes for new batteries. They also note that under a microscope, particles in the powder had larger pores than metals taken directly from a mine, and they were also less brittle. They note that more porous metals make better batteries because they enable better ion diffusion. They are also less likely to crack after repeated charging and discharging.

The researchers also made batteries using their recycled material and tested them using a protocol developed by USABC. They found they performed as well as or better than batteries made with virgin metals. Also, some of the members of the team have formed a startup called Battery Resources and they have already started selling their recycled materials. They have plans to build a facility capable of processing 10,000 tons of batteries a year by the end of next year.

More information: Xiaotu Ma et al, Recycled cathode materials enabled superior performance for lithium-ion batteries, *Joule* (2021). DOI: 10.1016/j.joule.2021.09.005

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