A Method for Lithium Recovering From Spent Lithium Iron Phosphate Batteries

Material Science

Climate Tech

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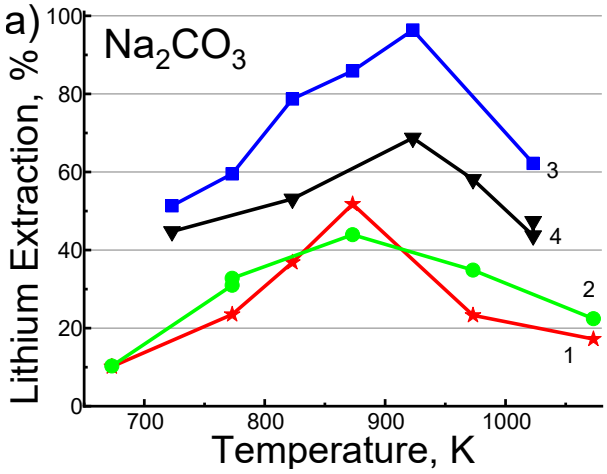
The growing use of lithium iron phosphate (LFP) batteries creates a need for efficient recycling. Unlike Li-Co-Ni batteries, LFPs yield only lithium as a valuable metal, making acid-based methods costly and inefficient. This technology applies a scalable pyrometallurgical process: aluminum is removed with sodium carbonate, lithium carbonate is recovered via cold-water leaching after sintering, and remaining solids are smelted to produce aluminum oxide and copper ingots—without hazardous chemicals or waste.



Lithium carbonate extraction yield after ice-water leaching with Me_2CO_3 excess: (1) 10% air, (2) 30% air, (3) 10% CO_2, (4) 30% CO_2."

APPLICATIONS

- Recycling of spent LFP batteries from electric vehicles and stationary energy storage systems
- Production of battery-grade lithium carbonate for reuse in cathode manufacturing
- Recovery of high-purity aluminum oxide and metallic copper as industrial feedstocks
- Integration into large-scale battery recycling facilities for sustainable material supply chains

DEVELOPMENT STAGE

Laboratory validation completed with both pure $LiFePO_4$ and real spent LFP batteries, achieving lithium recovery yields of 90–100% as lithium carbonate. Copper and aluminum recovered in high-purity solid forms. Next step: scale-up to a mini pilot unit (processing several kilograms of spent LFP batteries) within ~1 year, pending resources.

DIFFERENTIATION

No hazardous chemicals: avoids strong acids, corrosive agents, and costly reagents

Multi-metal recovery – produces lithium carbonate, aluminum oxide, and copper ingots

Environmentally sustainable – no hazardous liquid or solid waste generated

Industry-ready process – based on established, scalable industrial operations

REFERENCES

Leavitt et al, *Nature*, 2022

Yirmiya et al, *Cell*, 2024