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HYDROMETALLURGICAL PROCESS TO EXTRACT METALS FROM LFP-NMC BLACKMASS IN SPENT LITHIUM-ION BATTERIES

By

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ABSTRACT

Lithium-ion batteries are central to the global shift towards sustainable energy and electric transportation. As we witness the rise of gigafactories and recycling facilities worldwide, catering to the production and reclamation of batteries for electric vehicles, it becomes evident that a similar focus is required for smaller-scale batteries, notably those utilized in electric bicycles, a swiftly expanding market. The processes involved in recycling these batteries may not mirror those of electric vehicle batteries due to disparities in material composition. While electric vehicle batteries predominantly consist of NMC ($LiNi_xMn_yCo_zO_2$) or LFP ($LiFePO_4$) technologies, batteries for electric bicycles encompass a blend of NMC and LFP technologies.

Hence, there arises a necessity to devise adaptable recycling processes capable of handling varying compositions. Moreover, the hydrometallurgical methods employed for treating these materials must effectively recover cobalt, nickel, manganese, and lithium, despite the presence of fluctuating concentrations of iron, a challenge inherent to hydrometallurgy.

This presentation elucidates how leveraging the physicochemistry of transition metals in conjunction with phosphate enables the development of an efficient leaching process. Such a process selectively dissolves cobalt, nickel, manganese, and lithium from mixtures of NMC and LFP batteries, yielding a sufficiently pure leachate conducive to subsequent purification steps via liquid-liquid extraction post-leaching.

Keywords: Hydrometallurgy, Lithium-ion battery, recycling, LFP, NMC, cathode materials.