

Insights into the pre-treatment of spent LFP (LiFePO₄) EV batteries for direct recycling purposes

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Recycling of Li-ion batteries (LIBs) is a hot research topic among academic and industrial researchers. Especially for low-cost LIB chemistries, such LFP (LiFePO₄), direct recycling has become a popular strategy due to its potential to recover active materials in their intact form, as compared to the more conventional recycling routes. There is already a vast number of publications reporting novel methods of relithiation of spent LFP cathode active material (CAM). However, there is much less focus on the pre-treatment steps that must be taken before obtaining the CAM in a form suitable for regeneration. At the same time, the pre-treatment process influences the purity and chemical/mechanical integrity of the recovered CAM, which can largely affect the electrochemical performance of the regenerated material.

In this work, we present our latest findings on different parts of a pre-treatment process of spent LFP batteries from real-life EV applications, focusing solely on its impact on the purity and integrity of the recovered CAM. Specifically, we compare two methods of discharging, shedding new light on the choice of discharging method depending on the subsequent treatment strategy of the spent CAM. Further, we explore methods of delamination of the CAM from the aluminum current collector and compare the effects of different washing steps prior to the delamination to explore the possibilities of a greener approach to removing electrolyte residues from the CAM.