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RECOVERY OF $\text{LiMn}_{1/3}\text{Ni}_{1/3}\text{Co}_{1/3}\text{O}_2$ FROM SPENT LITHIUM-ION BATTERY USING A SPECIALLY DESIGNED DEVICE

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Abstract

Recycling of battery components for natural resources sustainability and consumer products has become an important endeavor that demands continuity through effective processes. In compliance with the need for waste management, $\text{LiMn}_{1/3}\text{Ni}_{1/3}\text{Co}_{1/3}\text{O}_2$ in the positive electrode of spent lithium-ion batteries has been recovered using specially designed device, consisting of two compartments separated with a plastic sieve of pore size 0.2mm. The upper compartment equipped with a mechanical stirrer contained the electrode pieces, while the lower compartment contained the powders recovered from the electrode pieces during the separation process. Both compartments were filled with a solvent such as N-N dimethyl formamide (DMF), N-dimethyl acetamide (DMAC) or dimethyl sulfoxide (DMSO) used to extract the binder in the electrode materials. The whole device was put in a hot bath maintained at a constant temperature. During the separation, the binder, polyvinylidene fluoride (PVDF) in the electrode dissolved in the solvent, which made the solid powders to fall off from the aluminium foils and then passed directly through the sieve pores into the lower compartment. This easy passage of the particles through the sieve pores without being adsorbed onto the foils made the separation much more efficient using the device. The XRD, SEM and the electrochemical performances results showed that the secondary use of the powder recovered in a new lithium-ion battery will be successful.

Key words: battery, extraction, recycle, separation, sieving

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