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Role of Fe(II) as Reductant Agent in Lithium-ion Batteries Recycling

Recycling lithium-ion batteries (LIBs) has gained attention recently due to the growing demand for electric vehicles and portable devices. The recycling processes have been developed based on metallurgical techniques, which typically treat the battery wastes with mechanical and thermal pre-treatment to facilitate the dissolution via acid leaching. Adding a reductant agent in the leaching system is a crucial factor in leaching efficiency due to the presence of insoluble metals in the solid, such as Co3+ and Mn4+, which need to be reduced to a lower oxidation state. H2O2 is the most common and predominant reductant in the LIBs recycling industry due to its oxidation does not release new ions to the system. However, the current process to produce H2O2 is costly and not environmentally sustainable. Hence, the search for alternative reductant agents should be addressed. This work studied the effect of Fe (II) as a reductant agent in the leaching process of LIBs cathodes. Batch extractions were carried out using a commercial LiCoO2 solid and a real LIBs waste (LiMn1.4Ni0.2Co0.05Ox). Different parameters such as Fe(II) dosage, time reaction and pH were evaluated. Under the optimal experimental conditions (50g/L; 2M HCl; 1M Fe(II), the extraction yield was approximately 100% for Li and Co from LiCoO2 as well as almost 100% of Li, Mn and Ni from LiMn1.4Ni0.2Co0.05Ox. According to the experimental results, adding Fe(II) enhances the extraction yield, confirming its role as a promising reductant agent for metal recovery.

Keywords: Recycling, hydrometallurgy, reductant agent, e-waste, circular economy

Biography:

Miss. María del Mar Cerrillo-Gonzalez, is graduated in Chemical Engineering and holds a MSs in Chemical Engineering, both by the University of Malaga. During her master thesis, she joined the GIGA research group to work in the field of battery recycling. Currently, she is a Ph.D student of the Chemistry and Chemical Technology Doctoral Program. Her research work is focused on the use of electro-based technologies to recovery resources from battery wastes.

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