

SELECTIVE CO-EXTRACTION OF Ni&Co FROM HIGH Ca/Mg SOLUTIONS

By

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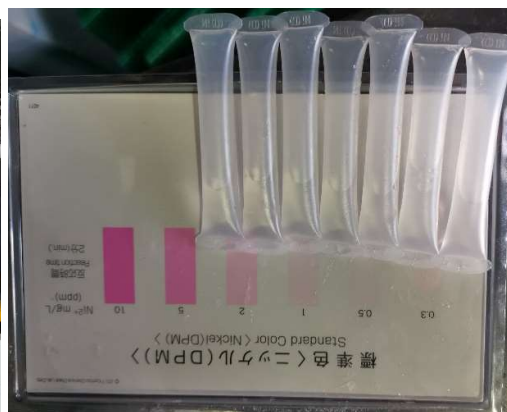
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ABSTRACT

Ni&Co extraction and purification is a critical operation for the preparation of high purity Ni&Co salts from various raw materials, especially in the NCM battery industry. However, due to the insufficient separation coefficient of industrial classic extractants, traditional Ni(Co) recovery and separation process has to go through operations of impurities removal extraction (Ca, Mg, Cu, Zn, Fe, Al, etc.) with D2EHPA, Co extraction with HEHEHP, Mg extraction with Cyanex 272, Ni extraction with HEHEHP in the case of spent LIBs, suffering issues of process redundancy, large reagent consumption and high cost. Even worse, loaded organic phase in procedures of Co extraction, Mg extraction require more than 8-stage acid scrubbing and produces considerable MgSO₄ wastewater containing small amount of Ni(Co). In current industry, most plants adopt Na₂S precipitation method to remove and solidified Ni(Co) into sulfides which releases toxic H₂S gas and generates Ni(Co)-Mg sulphide solid waste. Then, preferential extraction of Ni(Co) from Ca(Mg) concentrated solutions would be an ideal solution for these issues, based on what a synergistic extraction organic solvent consisted of acid and esters (HBL-116) was proposed. In single stage tests, high separation coefficient of $\beta_{Ni/Mg} > 500$ was obtained under optimal conditions, moreover, excellent separation performance was also achieved in industrial application. For example, selectively and completely extracted 1.0~5.0g/L Ni(Co) from 40~60g/L Mg contained scrubbing solution was achieved by HBL-116 extraction production line in Guangdong Fangyuan New Materials Group Co., Ltd., leaving <1mg/L Ni(Co) in raffinate and produced 35~50g/L Ni(Co) stripping solution with Mg<0.1g/L. In addition, the acid and alkali consumption is about 105~110% of stoichiometric ratio for Ni(Co) cation exchange depends on the concentration of Ni(Co) in feed solutions. According to the feedback from applied plants that HBL-116 shown excellent separation performance for Ni(Co) to Mg.



Keywords: Nickel, cobalt, Co-extraction, separation, magnesium, calcium.