Characterization of process water from lithium-ion battery recycling

Abstract International Conference for Resource Chemistry 2021

Ronja Wenz1, Fabian Brückner1, Daniel Horn1, Jörg Zimmermann1, Katrin Bokelmann1,*, Anke Weidenkaff1,2 and Liselotte Schebek1,2

1 Fraunhofer Research Institution for Materials Recycling and Resource Strategies IWKS, Brentanostr. 2a, 63755 Alzenau

2 Technical University of Darmstadt, Franziska-Braun-Str. 7, 64287 Darmstadt
** Corresponding author e-mail: katrin.bokelmann@iwks.fraunhofer.de*

Lithium-Ion Batteries (LIBs) contain various elements and compounds, i.e. cobalt, lithium, phosphorus and natural graphite. These four are on the European Union's list of "critical raw materials", thus making low-emission, cost-effective, and energy-efficient recycling processes essential. We are pursuing a mechanical recycling process for LIBs based on electro-hydraulic fragmentation (EHF). The EHF process supplements the crushing process of LIB as the first step for recycling. It breaks up composite material at the interfaces. LIB components can be recovered by sieving or sedimentation. This process produces significant amounts of wastewater as the fragmentation takes place in water. The electrolyte of the LIB contributes to the majority of the load in the process water. The electrolyte consists of several different organic solvents and the conducting salt $LiPF_6$. The conducting salt $LiPF_6$ hydrolyzes slowly at room temperature. The reaction products of hydrolysis are hydrogen fluoride, phosphoric acid and lithium fluoride. Only 12 % of the total fluorine is present as fluoride. The mass balance shows that 72 % of the lithium comes from the cathode material of lithium-ion batteries. The aim is to develop an efficient treatment and possibly recovery of the substances contained in the process water. As a first step, we here present the results of the analytical composition of process water from EHF in order to identify possible treatment technologies and estimate recycling potentials.

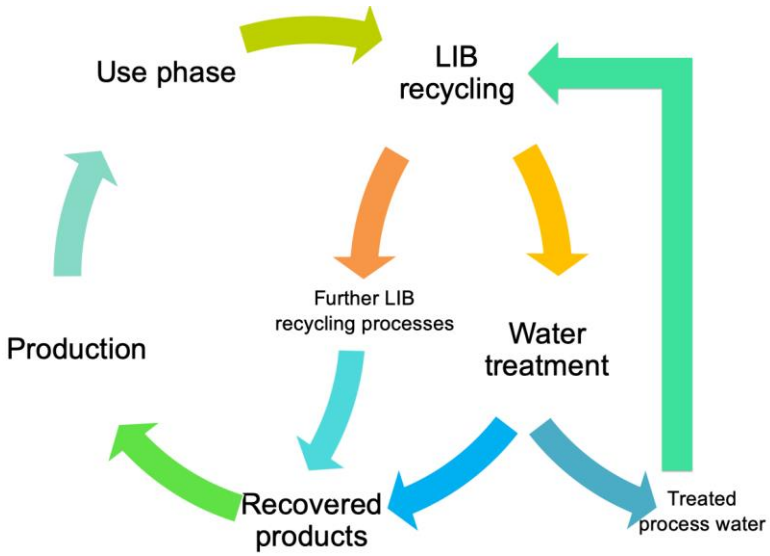

Figure 1: Scheme of our overall concept for the treatment of wastewater from lithium-ion battery recycling.