

SELFRAG equipment uses high voltage electric discharges to fragment solid materials along internal phase boundaries, liberating individual components from the surrounding matrix. This selective fragmentation has applications in research, recycling and mining. This study highlights the application of high voltage selective fragmentation in the enhancing metal recovery from electronic waste.

Recovery of high tech metals from electronic waste

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Purpose of Study

The difficulty in recycling and recovering electronic waste (e-waste) components, combined with the mining of raw materials needed to replace used electronics means that 'end of life' disposal of large amounts of e-waste, is a major environmental issue.

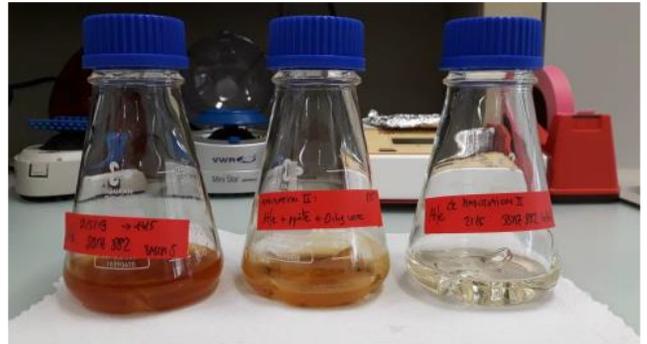
This study is to determine the potential advantages in the use of electric pulse fragmentation (EPF) in the recovery of high tech metals (e.g. REE's, indium) from waste electronics via (bio)leaching



iPhone components after EPF

Sample Treatment

A selection of used iPhones, one of the most common e-waste products, were fragmented in the Lab system using cycles of 25 pulses at 180kV. After each cycle samples were inspected and liberated components removed, with composite particles returned to the treatment until >90% were liberated. Products were then dried overnight at 70°C, sorted into separate material streams (e.g. crushed glass, electronic components, plastics, etc) and then leached both abiotically and biotically with various combinations of bacterial cultures. Metal concentrations in solution were then measured.



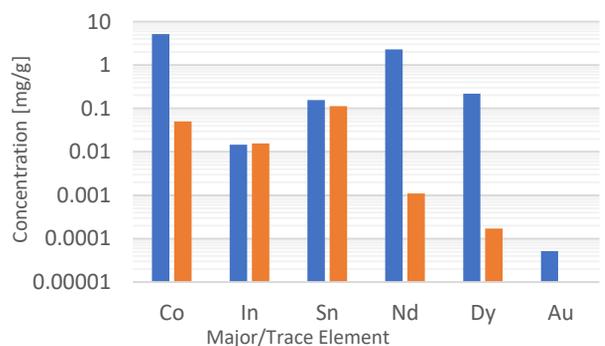
iPhone components in bacterial cultures

Quality of treated product

Results from leaching trials showed that bacterially mediated leaching generally gave greater deportation into solution for the metals of interest.

While there may be little significant difference in metal deportation to solution for mechanically separated or EPF separated materials, the advantage of EPF is that it is much faster than mechanically dismantling the waste.

Metal concentration in solution



Concentrations of metals in solution after biotic (blue) and abiotic (orange) leaching

This work was part of P.S.A's 2019 MSc project titled: "Etude de faisabilité d'un processus de biolixiviation pour le recyclage des métaux et terres rares contenus dans les téléphones portables". Scan the QR code to access the full thesis:



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