Enlightening advances in critical raw material recovery from industrial wastes using high voltage electric pulse crushers

DANIEL B. PARVAZ*[1], KATHY BRU[2], PIERRE ROSSI[3], PAULINE ANDREY[3], ALEXANDER WEH[1], FRÉDÉRIC VON DER WEID[1]

[1]SELFRAG AG, 3210, Switzerland
(*correspondence: d.parvaz@selfrag.com)
[2]BRGM, F-45060 Orléans, France
[3] EPFL, 1015 Switzerland

Electric pulse fragmentation (EPF) is a novel comminution process where 'lightning bolts', or highly energetic electrical discharges, are applied to materials immersed in water. These discharges exploit the variability in electrical and acoustic properties of a composite material and selectively fragment it along internal compositional boundaries.

EPF's applications in mineral processing are well documented [1], however its use in the recovery of critical raw materials from industrial waste is a relatively new field: Materials such as municipal waste incinerator bottom ash (IBA), e-wastes, and ultra-high-performance fibre reinforced concrete (UHPFRC) are metal rich, but pose a challenge to mechanical comminution (MC) circuits due to factors such as high compressive strength, abrasivity, or presence of fibres and wires that can block MC apparatus. For IBA much of the metal remains locked in the product after MC and is not recycled. E-waste is often complex requiring tailored processes to recover raw materials, while UHPFRC is a modern, relatively small waste stream, currently with no recycling process in place [2].

Initial results of EPF treatment of these wastes are presented and shown to be effective in liberating metal components allowing enhanced performance of subsequent traditional screening and metal recovery processes.

[1] Shi *et al*. (2014). *Chem. Eng. Technol* **37**, 1–6. [2] Bru *et al*. (2018) *Min. Eng.* **128**, 187–194