

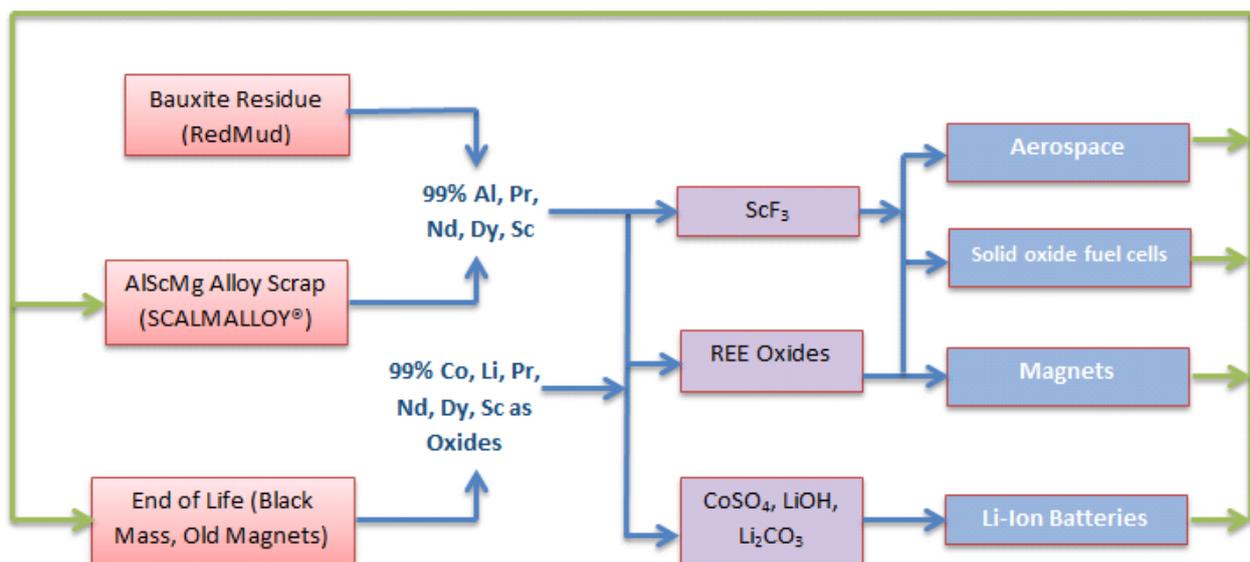
## Closing Materials Loops

A novel recycling process has been developed by MEAB. It is economically efficient, environmentally friendly and CO<sub>2</sub> neutral and it enables scandium and other critical raw materials (CRM) to be recovered from End-of-Life (EoL) products. This dissolution and separation method for critical raw materials was tested in our MEAB laboratory in Aachen. A European patent for the method is applied and the following application number: EP19160176.4 was granted.

MEAB will integrate other EoL streams to the process e.g. old Nd magnets and black mass out of Li batteries, to name the most promising, adding up to the European Sc value chain and other critical raw materials, ensuring safe long-term supply in Europe.

### Abstract

The method demonstrates a novel economic and environmentally friendly recycling process capable of efficiently dissolve, separate and recover several critical raw materials (CRMs), namely rare earth elements (lanthanides, yttrium and scandium), and metals from End-of-Life products containing a challenging mixture of metals such as EoL hybrid and electric vehicles ((H)EV) and waste electrical, electronic equipment (WEEE) and specific alloys used in different technical fields.



MEAB utilized its experience from other relevant European projects (EURARE, Red Mud, SCALE and RemovAL) to present this novel economic and environmentally friendly recycling process flow sheet, where scandium can be readily converted to value products such as an intermediate fluoride salt and scandium oxide. The MEAB flow sheet is one that employs well-established hydrometallurgical routes for example dissolution, solvent extraction and selective precipitation. No novel building blocks are used in the flow sheet; rather, it is a suite of intelligent and integrated unit operations that can be used for minimizing energy, reagents, consumables, effluent water, solid residue, carbon dioxide and organic waste. A flowsheet is constructed and illustrated for each of the process steps developed, and is based on experimental test work performed at MEAB. One block may include more than one function.

