

## New solutions for sustainable production of raw materials

Production of Scandium compounds and Scandium Aluminum alloys from European metallurgical by- products

### SCALE Project - Abstract

Scandium (Sc) is one of the highest valued elements in the periodic table and an element which is usually grouped in REEs as it shares many characteristics with Yttrium. Scandium technological applications are unique, as it is a key component in producing Solid Oxide Fuel Cells (Scandia-Stabilized-Zirconia solid electrolyte layer) or high strength Aluminum alloys used in aerospace and 3D printing applications (SCALMALLOY®). Yet Scandium supply is limited due to its scarcity and the high cost of its production, which currently takes place in Asia and Russia.

Europe has no production of Scandium, but is home to many Sc industrial end-users (Airbus, II-VI, KBM Affilips and others). In fact end-users like Airbus, are not deploying their Sc applications due to the lack of a secure Sc supply. The SCALE project sets about to develop and secure a European Sc supply chain through the development of technological innovations which will allow the extraction of Sc from European industrial residues.

Bauxite Residues from alumina production (5 Million tons on dry basis per year in Europe) and acid wastes from TiO<sub>2</sub> pigment production (1.4 Million tons on dry basis per year in Europe) have Sc concentrations which are considered exploitable, given a viable extraction technology. SCALE develops and demonstrates the value chain starting from residue and finishing to high tech end-product:

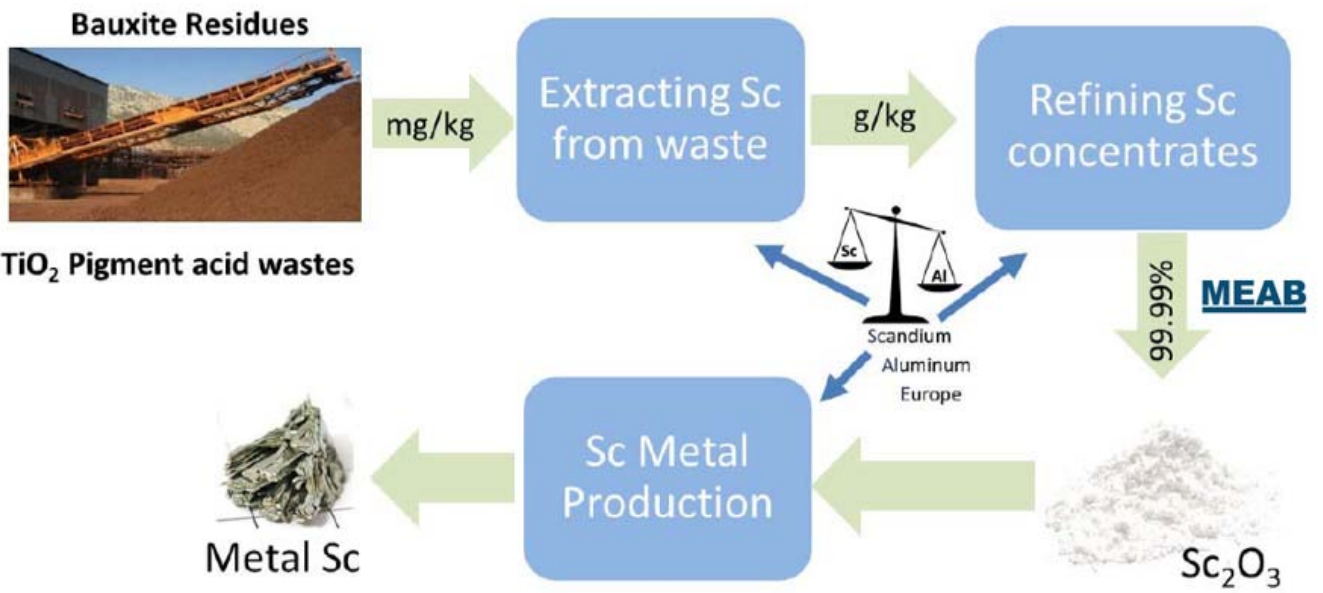
- SCALE develops innovative technologies that can extract economically and sustainably Sc from dilute mediums (<100 mg/L) and upgrade them to pure oxides, metals and alloys at lower energy or material cost
- SCALE extracts along with Sc all other REEs found in the by-products (AoG's BR on an annual base contain 10% of the European REE raw material imports)

The industrially driven SCALE consortium covers the entire Sc value chain with 7 major European industries and further features 8 academic and research institutes and 4 engineering companies with track records in RTD.

Giving a bit more details, the following, ambitious yet realistic objectives, are set for the SCALE project:

1. Produce commercial Scandium concentrates (at least 20% wt) from 2 European metallurgical by-products with innovative Sc selective technologies,
2. Refine Scandium concentrates to (at least 99% purity) Sc<sub>2</sub>O<sub>3</sub> and ScF<sub>3</sub> compounds with innovative technologies,
3. Reduce Sc compounds to Sc metal and Sc metal master alloys for end-user applications with innovative technologies,
4. Assess the sustainability of the developed technologies, and
5. Establish the foundation for a European Sc industry SCALE establishes the basis for a European Sc extraction and processing industry.

[http://cordis.europa.eu/project/rcn/206331\\_en.html](http://cordis.europa.eu/project/rcn/206331_en.html)



SCALMALLOY® 3D  
Printed components



Al-Sc Alloy



SOLID OXIDE FUEL CELLS:  
SSZ layer



LAZERS: YSG  
Garnets



II-VI