

Our Vision

Starting in 2025, we will create the first sustainable scandium producer in Europe.

ScaVanger will contribute to a more viable and cleaner future through use of lighter materials to achieve carbon neutrality by 2050 in a circular economy.

Our Mission

Based on an industrial symbiosis process, we reuse aqueous metallurgical residues from different metallurgical industries as feedstock for a continuous supply of an intermediate scandium hydroxide ($\text{Sc}(\text{OH})_3$) product, which contains 40 % scandium.

The metallurgical residues originate from titanium dioxide pigment processing, from alumina production (bauxite residues) and from nickel-cobalt laterite mining.

The intermediate scandium hydroxide filter cake will be refined and converted into various customized scandium compounds in a centralized hydrometallurgical refining plant.

The scandium compounds include high grade scandium oxide (Sc_2O_3), high-grade scandium hydroxide ($\text{Sc}(\text{OH})_3$), high-grade Al-Sc-N, and a relatively low-grade scandium fluoride (ScF_3).

The high-grade (99.99- 99.999 %) scandium compounds are needed for renewable energy cells (Solid Oxid Fuel Cells or SOFCs), for green hydrogen production (Solid Oxid Energizer Cells or SOECs) and for Al-Sc-N thin film depositions to be used in 5G and 6G applications.

The low-grade and low-priced scandium fluoride is needed in the aluminium industry for applications like extrusion, rolling, drawing, casting, and 3D printing of high strength aluminium alloys.

We will co-produce vanadium pentoxide and niobium pentoxide.

What is ScaVanger?

ScaVanger is a EIT (European Institute of Innovation and Technology) supported project (2021-2024) contributing to the development of a stable and sustainable European supply chain for scandium.

The total budget accounts for 4.5 million Euros.

Our innovation

We will provide a rapid near-real-time in-situ processing of scandium hydroxide from aqueous iron-chlorine solutions, which are residues from the titanium dioxide pigment production at full water recycling.

www.scavanger.eu

What Are the Scandium Applications and Markets?

Scandium compounds are critical for the green energy transition. The three main current scandium applications are:

- Thin film deposition of Al-Sc-N layers for 5G and 6G and power electronic applications.
- Solid Oxide Fuel Cells (SOFC) and Solid Oxide Energizer Cells (SOEC).
- Lighter and higher performance scandium containing aluminum alloys for the aircraft industry.

ScaVanger is advised by Airbus (Germany), Novelis (Germany), KBM (Netherlands), and SONACA (Belgium) for the aircraft sectors, by Solmates (Netherlands) for thin film Al-Sc-N deposition, and by Sunfire (Germany) for the fuel cell applications. GfE (Germany) is the advisor for vanadium pentoxide.

For the scandium market uptake of these applications, a reliable and stable European supply chain for scandium compounds must be established.

Currently, scandium is still 100 % imported into the EU (80 % from China and about 20 % from Kazakhstan). Therefore, scandium was classified in 2014 by the EU Commission as a CRM (critical raw material).



What Are Scandium Resources and Close-to-the-Market Projects

Important scandium resources are titanium dioxide pigment production, bauxite, and nickel laterite residual streams.

Numerous Western projects will soon reach the markets in Canada, USA, Australia, and Turkey.

Scandium Production in and for Europe

The EU funds the EIT upscaling projects ScaVanger and Scaleup, both follow-up projects from the H2020 SCALE project.

While ScaVanger focuses on iron chloride solutions from the titanium dioxide pigment production industries, Scaleup is upscaling scandium processing from bauxite residues at the Mytilineos aluminium plant in Greece.

www.scaletechnology.eu

Our Business Model

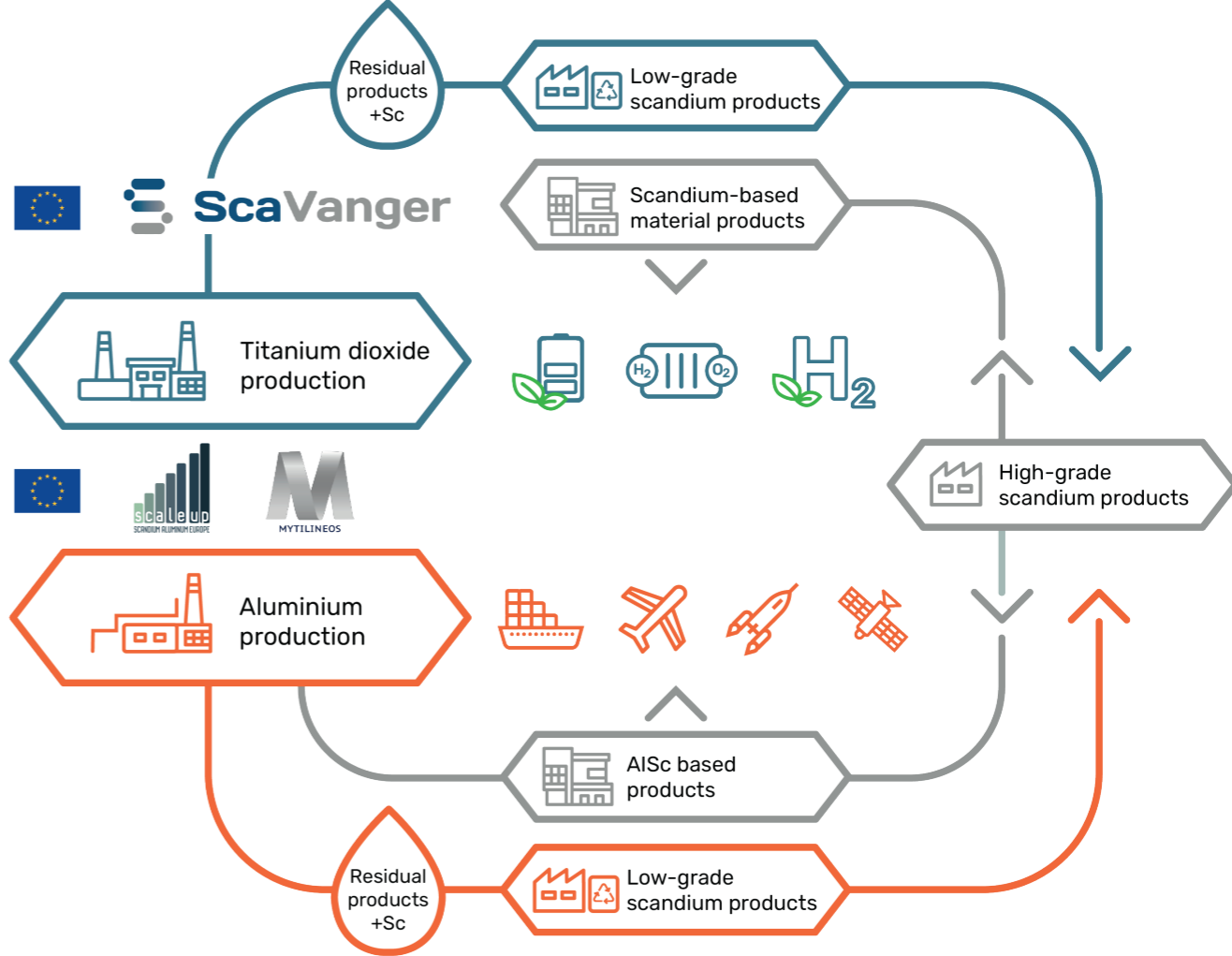
Scandium hydroxide (40 % Sc) will be produced at titanium dioxide pigment production plants.

A centralized refining plant will convert scandium hydroxide filter cake from various sources into customized high-grade scandium compounds for the SOFC, SOEC and Al-Sc-N markets, and a lower grade ScF₃ for the Al market.

The first scandium hydroxide production plant is expected to supply about 30 tpy equivalent Sc₂O₃.

The ScaVanger concept can be adapted and exported to titanium dioxide pigment production and alumina production plants in and outside the European Union.

European Scandium for a Lighter and Greener Future





MEAB



ORANO Mining a branch of ORANO, France, is the coordinator of the ScaVanger project. The Centre d'Innovation en Métallurgie Extractive (CIME) participates with the cleaning of the iron chloride solutions from contaminants, and scandium hydroxide production upscaling up to 40 % Sc in solvent extraction and ion exchange pilots.

<https://www.oranogroup/cime/fr>

MEAB Chemie Technik GmbH, Germany, expert in hydrometallurgy, contributes to the upscaling of scandium extraction from titanium dioxide pigment iron chloride rich residual solutions and designing pilot and industrial equipment.

www.meab-mx.com

Van der Laan International Consultancy BV (V.I.C), Netherlands, specialized in strategic management, marketing, and procurement of critical materials in the metal and mining industry contributes to the business model in cooperation with MEAB Chemie Technik GmbH (Germany).

www.vicinternational.eu

IME Process Metallurgy and Metal Recycling Institute at

RWTH Aachen University, Germany, contributes to scandium production with the development of customized scandium master alloys for thin film applications and the processing of niobium residues.

www.metallurgie.rwth-aachen.de

Technologies for Sustainable Metallurgy (TESMET) at the National Technical University of Athens (NTUA), Greece, performs purification processing of industrial by-products with ion exchange to extract scandium.

www.scaletechnology.eu

The Chair of Management Accounting (CON) at RWTH Aachen

University, Germany, a School of Business and Economics at the interface with engineering and natural sciences contributes to the business development, Fit-to-Operate analysis, and market assessment.

www.controlling.rwth-aachen.de

ENALOS, Greece, expert in sustainable solutions for the metallurgical, mining, and construction sectors, contributes with Life Cycle Assessment (LCA), Life Cycle Cost Analysis (LCC), Social Life Cycle Assessment (SLCA) and Fit to Operate Analysis.

www.enalos.com

CATURA Geoproject, Geosciences Conseils, France, specialized in raw material analysis from exploration to the metallurgy sectors, contributes to the project management, communication, dissemination, and business development.

www.catura.eu

EIT RawMaterials GmbH, boosts the upscaling project ScaVanger for securing scandium supply for the European industries.

www.eitrawmaterials.eu

ScaVa

ScaVa

What is the ScaVanger Consortium?

The ScaVanger consortium is composed of

- 2 industrial partners
- 2 academic partners
- 2 consultancies

from France, Germany, and Greece.

Each partner contributes for 30 % of funding.

The EIT Raw Materials GmbH contributes for 70 % of funding.



Engineering the Solutions of Tomorrow



**Cutting-Edge Technology
for Future Scandium
Independency**