

Innovative Value Chains for European Ceramic Oxide Fibres – InVECOF

Introduction:

Oxide fibre reinforced ceramics, so-called oxide ceramic matrix composites (O-CMC) are gradually becoming key strategic materials in multiple industrial applications, e.g. for use in next generation aero-engines, stationary gas turbines, power-to-X processes with concentrated solar power CSP, chemical industry, batch carrier for high temperature processes, etc. Today such high-end O-CMC components and the key raw material, the ceramic fibres as reinforcement component, are mainly exclusively produced in the United States. But as these are key components for the European manufacturing, energy and aerospace industry, there is a need to develop a European oxide fibre and O-CMC component industry, decreasing dependence on non-EU producers.

Activities in the project:

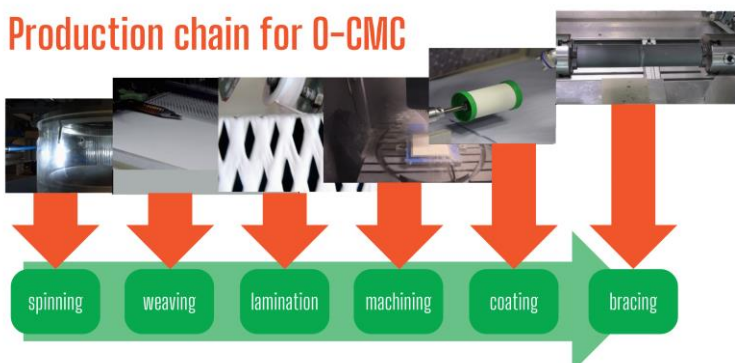
The InVECOF project addresses this urgent need and provides a substantial contribution to sustainable product innovation through the following key activities:

1. The development of a European oxide ceramic reinforcing fibre equivalent (ROF fibre) to US fibres and to establish it among end users in key industrial sectors and
2. The development and validation of a next-generation fibre in parallel with improved thermo-mechanical properties (NGO fibre).

The ROF fibre will present an equivalent to the dominant 3M™ Nextel™ fibres with better availability, without dual-use export restrictions and lower price. The NGO fibre will have improved thermo-mechanical properties compared to the benchmark fibres in order to make processes, plants, turbines, etc. more energy efficient through higher application temperatures.

InVECOF “Innovative Value Chains for European Ceramic Oxide Fibres” covers the whole process chain beginning from fibre development and production over weaving these fibres to fabrics to O-CMC manufacturing – coupons and demonstrators for every end-user application - up to testing Ox-fibres and O-CMC components in relevant environments with project partners for every step.

Production chain for O-CMC



Project facts:

Start date: 01/05/2022
End date: 30/04/2025

Duration in months: 36

Project budget: 8.6 mln €
EU contribution: 7.1 mln €

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Topic:

Critical raw materials for EU industrial value chains and strategic sectors

Keywords:

oxide fibres, oxide ceramic matrix composites, key raw material

Expected outcomes and impact:

InVECOF aims at creating a commercially available market within the EU for manufacturers of fabrics and O-CMCs. Both O-CMC manufacturers and industrial end-users will exploit these new fibres in their manufacturing due to their superior performance and ensured security of supply. Expected long-term impacts of InVECOF are:

- **Scientific impact:** New breakthrough in second generation fibre production with superior performance and lower price compared to the State of the Art.
- **Economic impact:** Larger and more secure supply of ox-fibres within Europe will enable increased production of O-CMC components in the EU. The resulting decrease of manufacturing costs and prices will enable the integration of these components in more and more products (like automobiles, wind turbines, fuel cells etc.)
Investments in the technology will be more secure and O-CMCs more widely used in application areas where they are not common yet (automotive / renewable energy industry)
- **Sustainability impact:** enhanced use of O-CMC will lead to significantly lower energy use and CO₂ emission, e.g.:
 - In manufacturing processes, 10% energy savings will be reached when increasing combustion temperatures with 100 °C in turbines as ox-fibres are more heat resistant.
 - 15% fuel savings (and resulting CO₂ emission reduction) in new aircraft when using ox-fibre composites in the aircraft body. In addition, up to 50% noise reduction and 80% NO_x emission reduction to be achieved.



The InVECOF project consortium is built upon a strong collaboration between RTO institutions, industrial producers of ceramic fibres and their end-users from aerospace and manufacturing industry.



Consortium:

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PYROMERAL Systems	FR
NLR	NL
Safran Ceramics	FR
RATH	AT
Porcher	FR
CNRS	FR
UNILIM	FR
ARIANEGROUP	FR
RHP	DE
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