

ONE YEAR OF TRIFLUORIUM

TriFluorium is developing a tribolysis-based route to recover fluorine from persistent, high-value organofluoride waste and convert it into safe, versatile inorganic fluoride products.

WHY THIS PROJECT MATTERS

Fluorinated materials are valued for their exceptional stability and durability, but these same properties make them difficult to recycle. TriFluorium is investigating whether controlled mechanical energy can support a new route towards safe and resource-efficient fluorine recovery.

IMPACT AT EU LEVEL

Europe relies on high-performance fluorinated materials across many advanced technologies, while viable end-of-life solutions remain limited. By exploring a new route for recovering fluorine into valuable or even CRM (CaF_2) resources, TriFluorium aims to expand circular economy and support European resilience.

48 Months

OF RESEARCH ROADMAP

TRL 4 Target

AT THE PROJECT END

9 Deliverables

SUBMITTED IN YEAR 1



TriFluorium Kick-off Meeting, Wiener Neustadt, February 2025

WHY FOLLOW TriFluorium

TriFluorium pursues a novel scientific approaches with validation of the tribolysis up to TRL 4 prototype scale — while addressing safety, efficiency and sustainability from the design phase and elaborating exploitation assessment plan for industry uptake.

A NEW APPROACH

Recovering fluorine differently

Explores how mechanical energy could transform persistent fluorinated waste into valuable safe products.

RESPONSIBLE FROM THE START

Safety built into development

Toxicology and sustainability are assessed alongside the technology —not at the development end phase.

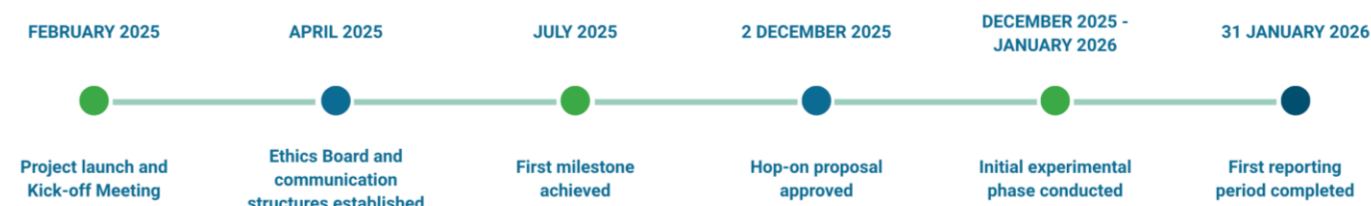
CONNECTED TO INDUSTRY

Designed with real needs in mind

Industrial expertise helps keep the research relevant to future applications and circular production.

FROM CONCEPT TO EVIDENCE

The first year was about building a credible experimental and decision-making foundation: defining relevant materials, preparing safe test systems and producing the first datasets needed to guide proof-of-concept work.



1st Milestone achieved

Defined waste, reactants, products of interest, apparatus and methodology was reached as planned

DEFINED

Research direction

Priority materials, target products, and assessment criteria were defined, achieving key project KPIs.

PREPARED

Experimental framework

Experimental, analytical, and monitoring strategies were established, and existing capabilities were adapted.

INITIATED

First research activities

Experimental, analytical, modelling, toxicological and sustainability work began, generating the first project data.

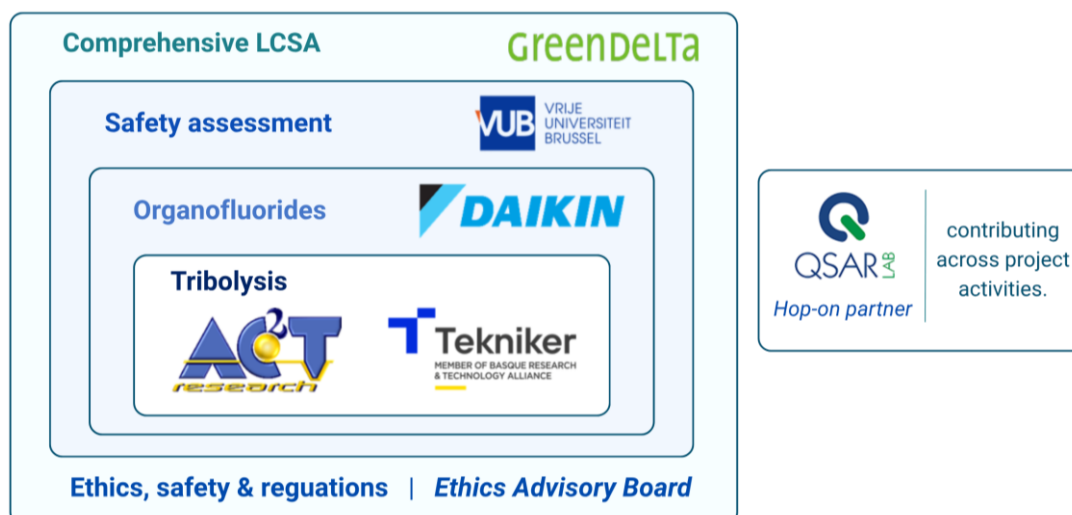
A MULTI-METHOD EVIDENCE BASE – FULL SAMPLE CHARACTERIZATION

Initial work combined tribological testing, analytical method development, ball-milling reference tests, and preliminary reactive molecular-dynamics studies. Ion chromatography method was developed to support fluoride quantification in challenging sample mixtures, while computational work began informing reaction mechanisms, toxicology, and sustainability assessment.

WHY IT MATTERS

To ensure tribolysis process safety and sustainability, alongside efficiency, comprehensive characterization is necessary, as by-products in gas, liquid or solid phase might jeopardize these process characteristics

COLLABORATION ACROSS EUROPE



TriFluorium partner roles across project activities

SAFETY AND SUSTAINABILITY BY DESIGN

TriFluorium advances technical feasibility together with safety, sustainability, ethics, data quality and exploitation planning. This parallel approach is intended to identify barriers early, while the technology can still be adapted.



ETHICS OVERSIGHT

Independent three-member
Ethics Advisory Board
appointed.



RISK MANAGEMENT

Risk-management procedures
and Standard Operating
Procedures (SOP) established.



SUSTAINABILITY ASSESSMENT

Environmental and social
assessment activities
initiated.



SAFETY ASSESSMENT

Experimental and
computational toxicology
initiated.



IP-SAFE PUBLIC COMMUNICATION:

Detailed materials, operating conditions, technical configurations, and preliminary findings remain confidential while scientific validation and intellectual-property assessment are ongoing.

COORDINATOR QUOTE

"The first year led to the shared scientific and operational foundation. We can now build on the lessons learned as TriFluorium moves towards stronger experimental evidence and future technology development."

Lucia Pisarova | Project Coordinator | AC2T research GmbH

LOOKING AHEAD

Next Stop: Brussels – The First Project Review Meeting



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