FIREFLY

FlexIble, predictive and Renewable Electricity-powered electrochemical toolbox For a sustainable transition of the catalyst-based European chemicaL industrY.

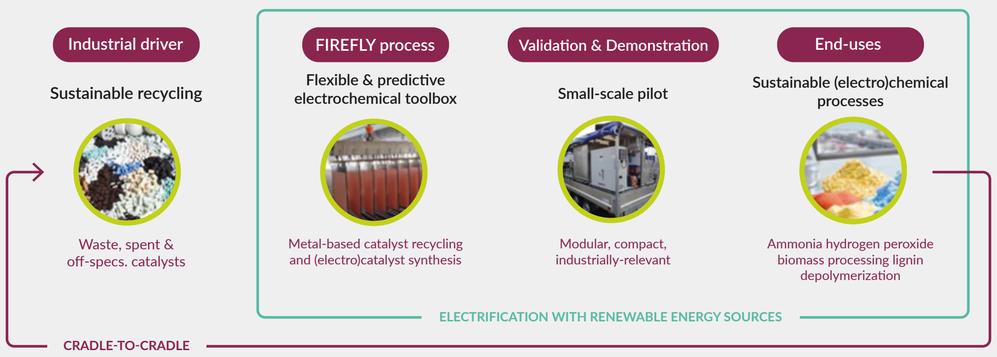
Catalytic processes are essential to the chemical industry, with around 90% of chemical processes and 60% of industrial products relying on them. Catalysts help to reduce energy consumption, increase product yield and improve reaction efficiency. However, many of the metals used in catalysis are classified as Critical Raw Materials (CRMs) by the European Commission due to their strategic importance and high supply risk.

Platinum Group Metals (PGMs)

78 Pt PLATINUM 195.08	46 Pd PALLADIUM 106.42	45 Rh RHODIUM 102.91	77 Ir IRIDIUM 192.22	79 Au GOLD 196.97	47 Ag SILVER 107.87	
27 Co COBALT 58.933	22 Ti TITANIUM 47.867	74 W TUNGSTEN 183.84	42 Mo MOLYBDENUM 95.95	29 Cu COPPER 63.546	28 Ni NICKEL 58.6934	30 Zn ZINC 65.38

Sustainable catalyst-based chemical industry

The FIREFLY project supports the sustainable evolution of the catalyst-based chemical industry towards its electrification and reduced third-party dependence on metals and fossil energy.

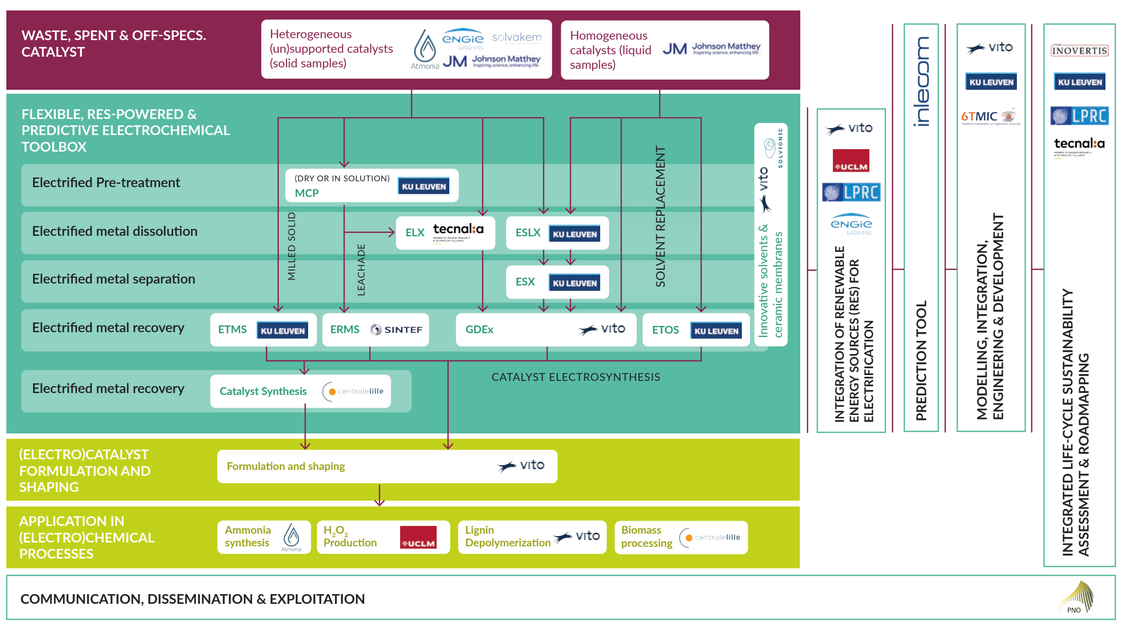


The FIREFLY concept relies on the development of:

- Electro-driven technologies for metal recycling from spent, waste, and off-specification catalysts available in Europe
- Efficient integration of renewable electricity
- A digital tool for predictive decision-making
- Production of (electro)catalysts for innovative (electro)chemical processes that overcome traditional production routes associated with high operating conditions, greenhouse gas emissions, and lack of circularity

Concept

The FIREFLY concept proposes a revolutionary approach to (electro)catalyst manufacturing by introducing RES and utilising secondary resources such as waste and off-specification catalysts. This will simultaneously reduce the production costs and improve the sustainability of the chemical industry.



MCP: Mechanochemical processing
ELX: Electroleaching,
ESLX: Electro-driven solvoleaching,
ESX: Electro-driven solvent extraction
ERMS: Electrochemical recovery from molten salts
ETMS: Electrochemical transformation in molten salts
ETOS: Electrochemical transformation in organic solvents
GDEx: Gas-diffusion electro-crystallisation

Objectives

Power-to-catalysts and chemicals fostered via electrochemical recycling

The FIREFLY project aims to electrify a large part of the chemicals value chain in a sustainable way (environmental, economic and social): **power-to-catalyst and chemicals fostered via electrochemical catalyst recycling**. The goal will be achieved through 7 specific objectives:

1. Research, develop, and optimise to TRL4 innovative and sustainable electrified technologies for recycling metal-based catalysts and the downstream (electro)chemical synthesis of strategic (electro)catalysts.

2. Research, develop, and optimise the powering by RES considering performance, environmental friendliness, and cost-efficiency in this electrification scenario.

3. Research, develop, and optimise a machine learning/artificial intelligence (ML/AI) based digital tool to support the decision-making of the enhanced metal recycling and catalyst synthesis processes.

4. Develop the modelling- and simulation-based engineering framework to support the understanding, innovation and optimisation of the design, operation, validation, and demonstration of the FIREFLY process.

5. Demonstrate the TRL6 electrified FIREFLY process for the recycling of metal-based catalysts, simultaneous production of (electro)catalysts, and validation of the latter in selected (electro)chemical applications.

6. Assess the integrated sustainability of the FIREFLY concept and benchmark it versus the State of the Art (SoA) recycling and production of catalysts and selected chemical manufacturing applications.

7. Communicate, disseminate and exploit the activities and results of the project to interested stakeholders in the chemical value chain to ensure further research and innovation (R&I) and market uptake.

COORDINATION TEAM

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STAY IN TOUCH

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Funded by the European Union under Grant Agreement No 101091715. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Health and Digital Executive Agency (HaDEA). Neither the European Union nor the granting authority can be held responsible for them.