Brussels, 16 September 2024

[Immediate release]

PEACOC Project returning value from customers' waste streams

The PEACOC project – short for "**P**re-comm**e**rci**a**l pilot for the efficient re**c**overy of Preci**o**us Metals from European end-of-life resources with novel low-**c**ost technologies", announces significant advancements as it reaches important milestones in its 36th month of operation. The upscaling operations occur amidst favourable policy developments, with the recent adoption of the Critical Raw Materials Act (CRMA), imposing a threshold of 25 % for recycling, and 40 % for processing of its annual critical raw materials (CRMs) needs. The timely adoption of the legislative act underscores the EU's policy's shift towards sustainability and circularity, with a clear objective to secure resilient supply of critical metals vital for its green transition.

Microwave-assisted leaching and gas-diffusion electrocrystallisation moving towards a pilot-scale installation

Launched in May 2021, this European initiative aims to demonstrate at pre-commercial scale (TRL 7) the capacity to recover platinum group metals (PGMs), gold (Au) and silver (Ag) from three different waste streams: automotive catalysts, printed circuit board assemblies (PCBAs) and photovoltaic (PV) panels. The simplified process flowsheet follows three main stages: 1) collection, 2) pre-treatment and concentration, and 3) refining. Following a 'zero-waste' approach, the metals recycled within PEACOC will be further tested and used across different applications and industries: from new catalysts and catalytic nanoparticles for electrochemical energy technologies to 3D-printed products and single metals.

Following last year's successful enhancement of the second stage of the project - concentration - attention now turns to the optimisation and upscaling of the refining stage involving key partners VITO (Belgium), CEINNMAT (Spain) , and 6TMIC (France). This phase is dedicated to the development and optimisation of the **microwave-assisted leaching (MWAL)** and the **gas-diffusion electrocrystallisation (GDEx) and to the upscaling of these refining technologies from TRL 4 to TRL 7 in a fully operational pilot plant.**

Microwave-assisted leaching process

Having successfully retrieved PGMs from spent autocatalysts, researchers at VITO managed to reduce the MW-assisted leaching operating costs by optimising the chemicals consumption, enhancing the equipment durability and mitigating the corrosiveness of the leaching solution. The implementation of the process was also further expanded towards the extraction of gold and silver form waste PCBAs and PV panels.

These additional optimisations assisted partner CEINNMAT in completing the processing and building of the MW assisted leaching pilot-scale, in WP6, together with the innovative

Funded by the European Union

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 958302.

microwave reactor and control system developed, marking an important step in the upscaling phase of the PEACOC project. The primary objective of the design of the pilot plant was to ensure the optimised MW processes can operate with a continuous flow, which has been a milestone in microwave technology progress. This task was further compounded by the need to streamline operations to the specific conditions required by each end-of-life (EoL) source for extracting PMs, all while addressing the problem of running operations in corrosive environments and reducing the energy consumption to a minimum while achieving near complete PM extraction.

After building, testing, optimising and validating the first reactor prototype featuring a capacity of 1.4 litre, seven reactor units are now being integrated in the MWAL pilot system. The development on the continuous flow demonstrator was focused on the synchronised operation of the seven reactors to reach the set-forth objective of reaching at least a 50 L/h processing capacity. The final modular MW system will be mounted and integrated into a transportable container, and its design facilitates the upcoming incorporation in the PEACOC pilot for autocatalyst leaching**..**

Gas-Diffusion Electrcrystallisation process

The other team of researchers at VITO has successfully upscaled and assessed the operations of gas-diffusion electrocrystallisation (GDEx) – an electrochemical process of reactive precipitation of metals in solution with oxidising or reducing agents produced in-situ by the electrochemical reduction of a gas, in a gas-diffusion electrode.

Using industrial low-grade material supplied by Johnson Matthey (JM), VITO researchers tested the upscaled GDEx unit in continuous operation mode to evaluate precious metals recovery. With an optimised design enabling continuous operation mode, the GDEx unit, featuring a 2-cell stack configuration, achieved a remarkable selectivity >**95 % for palladium (Pd).** This significant improvement in selectivity, compared to laboratory setups, shows the pilot's effectiveness in recovering PMs. Researchers at VITO are confident that these promising results can be further explored and are already contemplating scaling up to a 6-cell configuration in an attempt to improve the system's performance and to facilitate operation under milder conditions.

The enhanced selectivity for precious metals occurring at pilot scale came along with significant increase in efficiency and further reduction in power consumption – a notable decrease of up to five times lower than the experiments conducted at laboratory scale.

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Figure 1. Photos of the PEACOC pilot

About the PEACOC project

The PEACOC project is a collaborative research endeavour involving prominent European research institutions launched in May 2021 to develop and showcase a first-of-a-kind economically and environmentally viable pre-commercial metallurgical system for recovering PMs – a metal family which includes Platinum Group Metals (PGMs), as well as Au and Ag. PMs are highly important for the EU economy and have been deemed critical raw materials by the European Commission. The PEACOC concept is founded on previously developed recovery and refining technologies, upscaled to TRL 5 in the PLATIRUS project: Deep Eutectic Solvents (DES) based extraction and separation of PGMs, Microwave-assisted leaching (MWAL), and gas-diffusion electrocrystallisation (GDEx).

Coordination team

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