Microwave-assisted leaching of precious metals from end-of-life products

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This study presents results on the use of microwave-assisted leaching (MWAL) to efficiently extract precious metals, specifically Pt, Pd, and Rh from spent automotive catalysts (SACs), and Ag and Au from pretreated end-of-life (EoL) photovoltaic (PV) panels and printed circuit board assemblies (PCBAs). High extraction rates and selectivities were achieved by utilizing a chloride-based leaching environment, with the addition of oxidizing agents when necessary to enhance metal solubility. The findings indicate that nearly complete extraction of PGMs from SACs can be achieved at significantly lower HCl concentrations and without the addition of an oxidizing agent at shorter reaction times (minutes instead of hours) than in current state-of-the-art hydrometallurgical processes. Furthermore, temperature played a crucial role to increase PGM leachability, especially in the case of Rh extraction. For Ag recovery from EoL PV panels, MWAL achieved almost complete Ag extraction at 150 °C within 30 minutes using a leaching system consisting of HCl, NaCl, and H_2O_2. Similarly, nearly complete Au extraction was obtained using a lixiviant containing HCl, NaCl, and NaOCl. Selective Au extraction towards Ag is possible by finetuning the used NaOCl concentration. The results underscore the potential of MWAL as a rapid and effective method for precious metal extraction from EoL products, with ongoing upscaling efforts to pilot scale (TRL 7) incorporating MWAL as a key technological component. The PEACOC project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958302.