KU LEUVEN

Solvometallurgical recovery of PGMs

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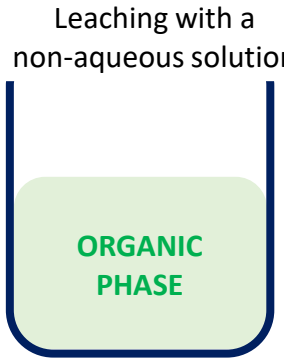
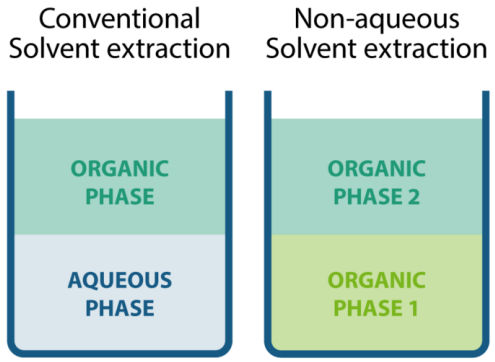
Technology concept and description

KU Leuven has developed three different innovative technologies for the recovery of PGMs

Selective leaching



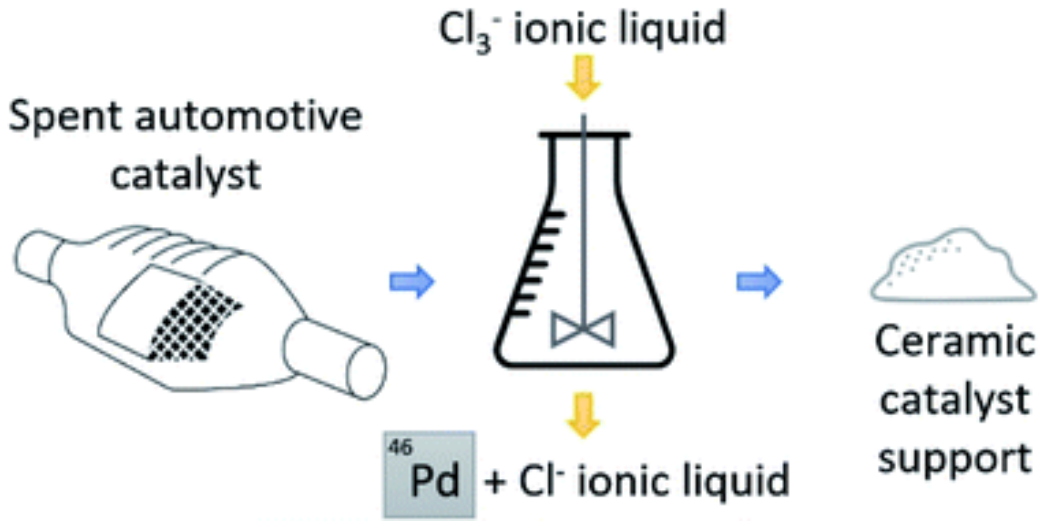
Non-aqueous solvent extraction with two immiscible organic phases



Key benefits of solvometallurgy

- Different mechanisms of extraction can be exploited, this can be translated into **higher selectivities**
- Can be **environmentally friendly**, depending on the non-aqueous solutions that are used
- Solvents can usually be easily **recovered/recycled**
- **Process intensification:** the number of steps in a process can be reduced because leaching/selective extraction can be combined in one step
- **Individual** metals or **mixtures** of them can be obtained

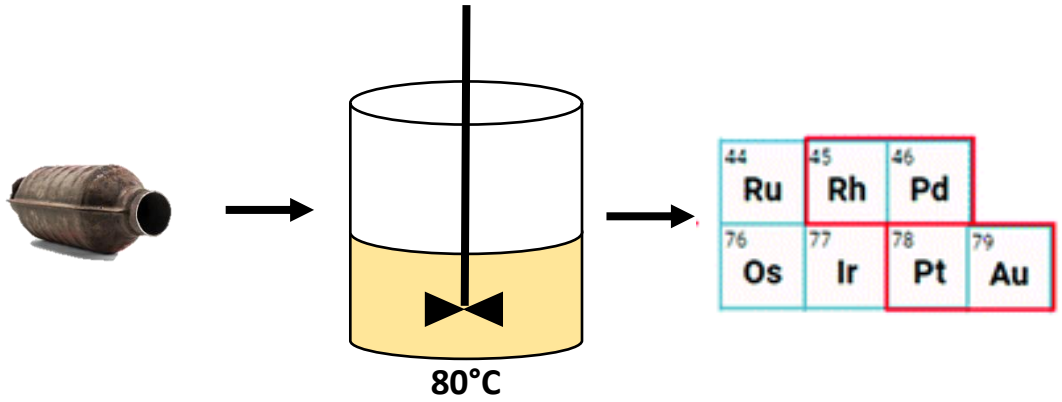
Dissolution behavior of precious metals and selective palladium leaching from spent automotive catalysts by trihalide ionic liquids



- Three trihalide ionic liquids, $[P_{66614}][Cl_3]$, $[P_{66614}][Br_3]$, $[P_{66614}][I_3]$, and one mixed trihalide ionic liquid $[P_{66614}][IBr_2]$ were synthesized
- Leaching with trichloride ionic liquids greatly improved the selectivity for palladium
- Simple process
- Only allows the recovery of Pd
- Environmentally friendly / ionic liquids can be reused

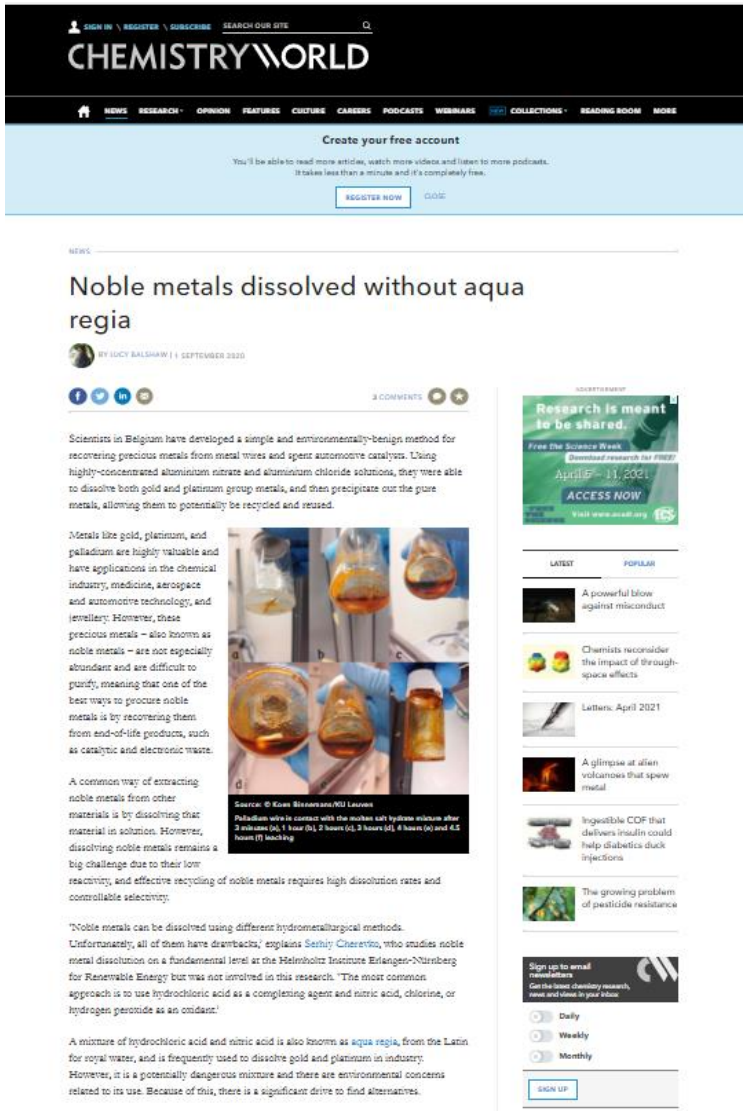
A. Van den Bossche, N. Rodriguez Rodriguez, S. Riano, W. Dehaen, K. Binnemans, ***RSC Adv.***, 2021,**11**, 10110-10120

Dissolution of noble metals in highly concentrated acidic salt solutions



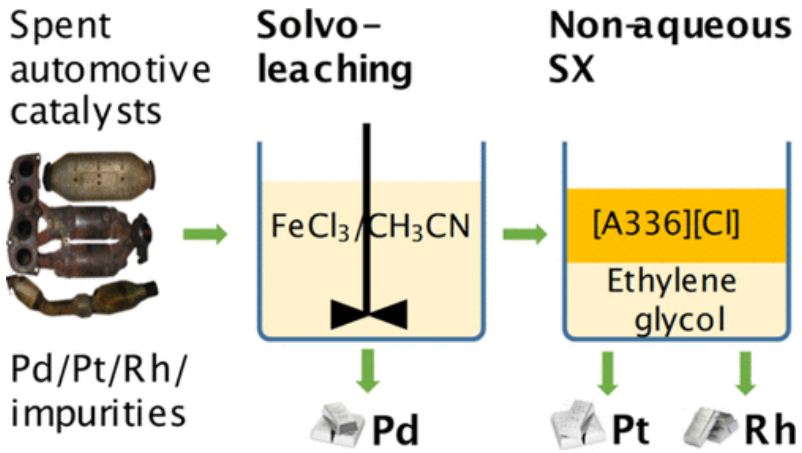
$$AlCl_3 \cdot 6H_2O + Al(NO_3)_3 \cdot 9H_2O$$

- **95% Pd** was leached from spent automotive catalysts in **15 min at 80 °C**, while Pt required longer
- Pd recovery was investigated by selective reductive precipitation
- No harsh conditions/chemicals such boiling aqua regia are needed

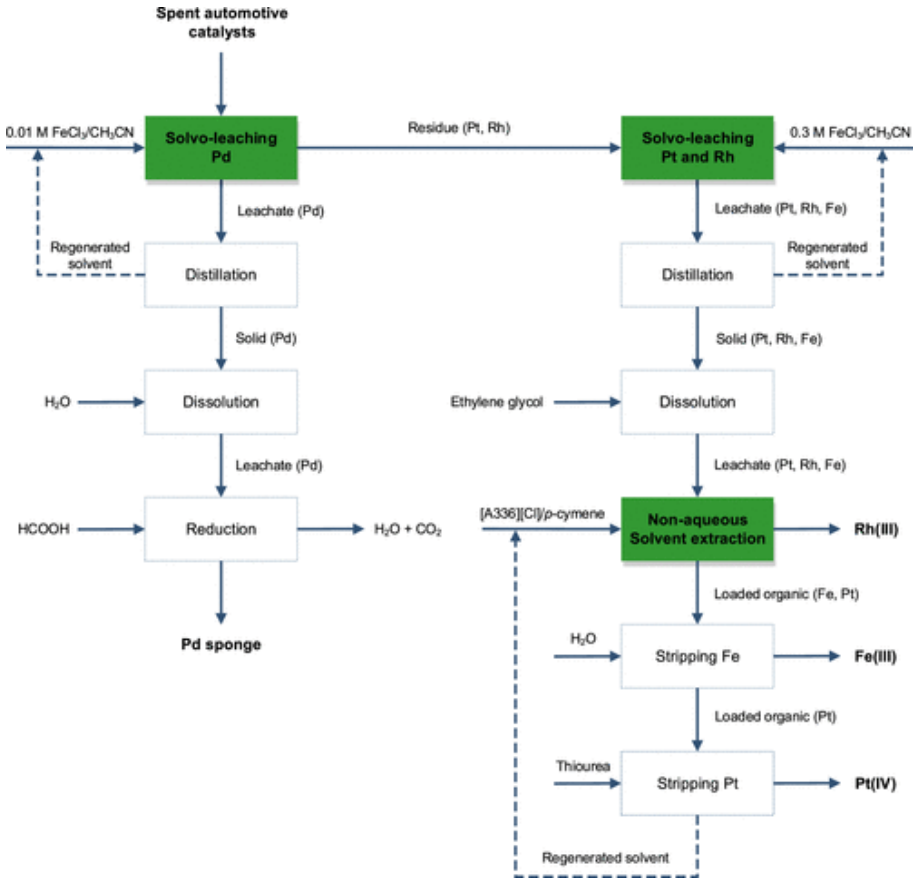


F. Forte, S. Riaño and K. Binnemans, ***Chem. Commun.***, 2020, 56, 8230 (DOI: 10.1039/d0cc02298e)

Solvometallurgical Recovery of Platinum Group Metals from Spent Automotive Catalysts



- Closed-loop system
- Less hazardous chemicals
- Avoids the emission of toxic or flammable gases while reducing consumption of acids/bases
- Highly selective
- Limits the generation of waste water



V.T. Nguyen, S. Riano, E. Aktan, C. Deferm, J. Fransaer, K. Binnemans, ***ACS Sustainable Chem. Eng.*** 2021, 9, 1, 337–350

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