Recycling and recovery of precious metals: from industrial waste to efficient catalysts

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The development of a modern economy is based on an optimal use of natural resources, and thus on recycling. The recovery of precious metals from electrical and electronic equipment waste (WEEE) represents an attractive way to manage their increasingly low abundance. However, the exploitation of WEEE remains limited, mainly because of the high variability and complexity of waste flows.[1] In parallel, the demand for precious metals for chemical applications is increasing, due to their performance in catalysis. Our laboratory is addressing the development of innovative short economic circuits of precious metals with the direct use in catalysis of precious metals recovered from WEEE.[2] Supported precious metals (Au, Pd, Pt, etc.) present high catalytic performance in a wide range of reactions. The principal challenge of this project is to prepare oxide supported Pd-based catalysts, with a minimum of purification steps, simplifying the existing recycling processes. A general scheme of the preparation strategy is presented in Figure 1.

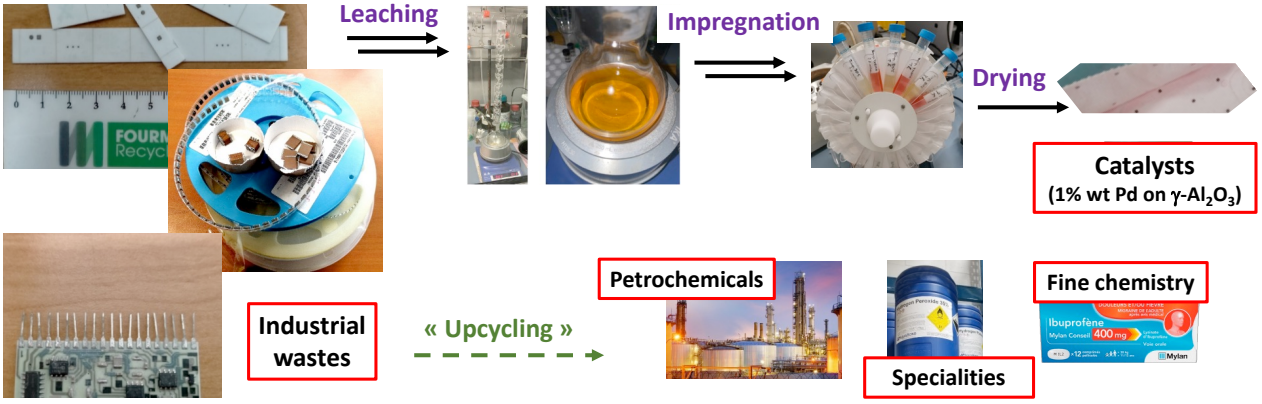

Figure 1: General strategy for the direct valorization of Pd recovered from electronic waste to prepare palladium supported heterogeneous catalysts.

The multi-metallic catalysts thus obtained have been evaluated for some catalyzed reaction of interest: methane total oxidation and hydrogenation reactions.[3] The impact of deactivation/poisoning by other elements arising from the WEEE processing scheme will be discussed in detail.

References

[1] D. Bourgeois *et al.*, *Hydrometallurgy*, **2020**, 191, 105241.
[2] V. Lacanau *et al.*, *ChemSusChem*, **2020**, 13, 5224-5230.
[3] M. Martin Romo y Morales *et al.*, *ChemCatChem*, **2023**, 15, e202300354.