Promising extraction of palladium precious metal from aluminosilicate-supported catalysts by supercritical CO_2 assisted by polymers

Patrick Lacroix-Desmazes,[1]* Andrea Ruiu,[1] Karine Seaudeau-Pirouley,[2] Marin Senila,[3] Sarah Böringer,[4] Bernhard Bauer-Siebenlist[5]

[1]ICGM, Univ Montpellier, ENSCM, CNRS, Montpellier, France
[2]Innovation Fluides Supercritiques, IFS, 1 rue Marc Seguin, INEED Rovaltain TGV, Alixan, France
[3]INCDO INOE 2000, Research Institute for Analytical Instrumentation – ICIA, Cluj-Napoca, Romania
[4]Fraunhofer Institute for Chemical Technology ICT, Joseph-Von-Fraunhofer-Str. 7, Pfinztal, Germany
[5]Heraeus Deutschland GmbH & Co. KG, Heraeusstr. 12-14, Hanau, Germany
* E-mail: patrick.lacroix-desmazes@enscm.fr

Precious metals, especially palladium (Pd), have a crucial role in daily life thanks to their use in a wide range of applications from electronics to automotive catalysts. However, important industrial markets like Europe, India and China have not natural resources of palladium. Spent end-of-life supported catalysts are a strategic secondary resource to ensure the future supply of such critical metals. Nowadays, pyrometallurgical and hydrometallurgical processes are used for the recovery of the metals from spent catalysts but these methods are high energy demanding and generate large volumes of effluents to be treated. In contrast, SUPERMET project aims at developing a green process to recycle precious metals, in particular palladium (Pd) and platinum (Pt), especially from spent supported catalysts from petrochemistry and automotive catalysts. The technology consists in metal extraction in supercritical CO_2 ($scCO_2$) thanks to CO_2-philic complexing polymers bringing the insoluble precious metal into the $scCO_2$ medium (Figure 1) [1].
In this contribution, we will present promising results regarding the polymer-assisted extraction of palladium from aluminosilicate-supported catalysts in supercritical carbon dioxide. We have tested various CO_2-philic polymers bearing different complexing units for the metal extraction experiments. One successful polymer was the poly(4-vinyl pyridine-*grad*-1,1,2,2-tetrahydroperfluorodecylacrylate) gradient copolymer, named P(4VP-*grad*-FDA), which was able to extract up to 73% of palladium from the aluminosilicate support.

Fig. 1: *Extraction of Pd precious metal from supported catalyst by CO_2-philic complexing polymers in supercritical CO_2*

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