Towards a circular economy for platinum in Europe

Michael Saidani, Alissa Kendall, Bernard Yannou, Yann Leroy, François Cluzel

Towards a circular economy for platinum in Europe

Around 40% of the platinum used in EU catalytic converters is not recovered for recycling and is therefore 'lost' forever, indicates a new study. A more circular economy for platinum is essential to reduce imports of this critical raw material to the EU and minimise its damaging effects on the environment, the researchers argue. Better collection systems for end-of-life catalytic converters and tighter regulation of waste exports could help close the loop on platinum.

Platinum is one of 27 critical raw materials (CRM) listed by the European Commission[1], and is economically important to the EU. Some 69% of platinum demand is for catalytic converters, which improve air quality by reducing emissions from vehicle exhaust pipes. There are several key economic and environmental reasons for increasing the recycling rates of platinum:

1. To meet rising demand for the material. This is driven by an increased need for catalytic converters in response to the Euro VI emission standards for heavy vehicles, which became mandatory in 2013, and the upcoming (2020) Stage V legislation for non-road engines such as construction vehicles. There is also an emerging and significant market for the material's use in fuel cells for electric vehicles. In the long term, although the rise of electric vehicles will reduce the need for catalytic converters, the associated reduction in platinum demand may be outweighed by an increase in fuel cells.
2. To create a more secure supply chain for the EU: 98% of platinum is currently imported, and mostly from just two countries, Russia and South Africa.
3. To minimise problems with extracting the material from increasingly poor-quality grades of ore. The cost and environmental impact of mining increases as a material becomes harder to extract.
4. To cut the significant environmental impact of producing platinum. Producing just 1 kg of primary platinum (from virgin sources) emits 40 tons of CO_2 and consumes 200 gigajoules (GJ) of energy. In comparison, producing 1 kg of platinum from secondary (recycled) sources emits one twentieth of the emissions (2 tons of CO_2) and consumes 10 GJ of energy. Platinum is also an environmental pollutant, although research is needed to understand its potential ecological and health impacts.

This new study helps pave the way for higher recycling rates by mapping out primary platinum's value chain: that is, the 'journey' taken by platinum for catalytic converters in the EU, from mine to production to use and, finally, end-of-life (EoL) treatment and recycling. At each stage of this journey, the researchers identified the stakeholders involved (including specific companies) and their numbers and locations. They then calculated how much platinum 'leaks' from each stage of the value chain, never to reach EoL recycling.

The analysis used data for the year 2017 – from sources including technical, industrial and market reports, academic publications and environmental and governmental agencies – and for the EU-28. It revealed that around 14.2 tons of platinum leaked from the EU-28 value chain in 2017. This represents around 39% of all primary platinum that entered the chain (36.6 tons).

The biggest loss (9.2 tons, or around two-thirds of the lost platinum) occurs when vehicles reach EoL. The researchers say that this hotspot of platinum loss can be explained by insufficient collection systems for old catalytic converters and unregulated exports of EoL vehicles, mostly to eastern Europe and northern Africa. Another 3.5 tons of platinum, or around one-quarter of losses, leaks during consumer usage – for example, through wear-and-tear and chemical reactions within the converter.

A further 1.1 tons leaks when EoL catalytic converters are prepared for recycling (e.g. dismantled, crushed) and 0.4 tons during recycling itself.

The study concludes that actions to increase overall collection, recovery and input rates of secondary platinum in the value chain are of utmost importance in securing future and sustainable production of new generations of catalytic converters and fuel cells. Further, by identifying the specific actors at each stage of platinum's value chain, the study helps policymakers learn how they might build a network of stakeholders who could work together to close the loop on platinum (Saidani et al., 2019).

Footnotes:

1. https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en

Reference: Saidani, M., Kendall, A., Yannou, B., Leroy, Y., Cluzel, F. (2019) Closing the loop on platinum from catalytic converters: Contributions from material flow analysis and circularity indicators. *Journal of Industrial Ecology*. 1– 16. DOI: 10.1111/jiec.12852

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#DYK: Producing just 1kg of #platinum emits a massive 40 tons of CO_2 – but using recycled platinum cuts these emissions to just 2 tons #CircularEconomy @EU_ENV

Demand for #platinum is rising – to make #FuelCells and #CatalyticConverters [car emoji]. But where's it all going to come from? More recycling needed! [recycling emoji] #CircularEconomy @EU_ENV