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Image source: BASF

SUBSTITUTION AMONG PLATINUM GROUP METALS

Replacing palladium with platinum in autocatalysts is a potential driver of platinum demand growth

BASF, the German chemicals giant, announced recently that it has successfully developed and tested new autocatalyst technology that enables the partial substitution of high-priced palladium with the relatively lower-priced platinum in light duty gasoline vehicles, without compromising emissions standards.

This follows confirmation earlier this year from Johnson Matthey, which produces a third of all car autocatalysts globally, that platinum could be replacing palladium in 'underfloor' catalyst units in gasoline cars by February 2021.

These two developments, reinforcing the view that platinum can be used in place of palladium in today's emissions-control environment, mark a further evolution in the patterns of usage between platinum and palladium that have varied over the past four decades.

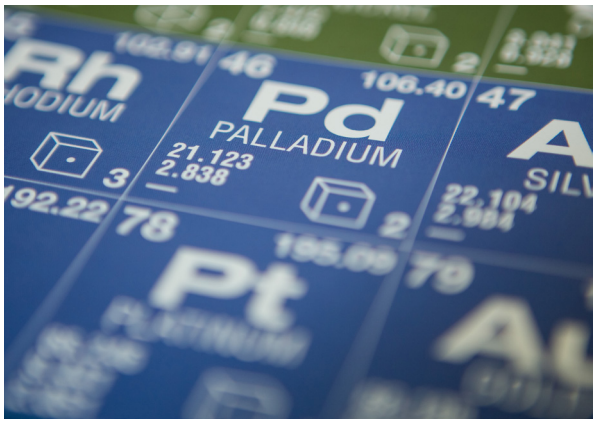
Since platinum group metals (PGMs) were used in the first-ever autocatalysts, or catalytic converters, developed in the 1970s, substitution by one PGM for another has been a feature.

PGM usage is determined by multiple factors including the effectiveness, availability and price of each metal, as well as tightening emissions standards.

The catalytic efficiency of each metal is influenced by engine temperature, fuel type, fuel quality and durability of the type of PGM-coating or 'washcoat' used to fabricate the autocatalyst.

In the 1990s, the low price of palladium led to it replacing platinum in gasoline autocatalysts, despite twice as much palladium than platinum being required to achieve the same level of emissions control.

This 2:1 substitution ratio was necessary at the time because palladium's catalytic efficiency is compromised by the presence of sulphur; gasoline then had a relatively high sulphur content.



The high price, sustained demand growth and limited supply growth of palladium is making material platinum demand growth due to substitution of some palladium in gasoline cars extremely likely

World Platinum Investment Council

During the 2000s, the sulphur content of fuel reduced; gasoline fell significantly from over 400 parts per million to under 100 parts per million. This reduced sulphur content affected patterns of PGM usage in autocatalysts in two ways. Firstly, it was no longer necessary to use double the amount of palladium than platinum in gasoline autocatalysts, meaning that the 'substitution ratio' between the two metals moved from 2:1 to 1:1. Secondly, reducing diesel sulphur content meant that the use of some palladium in diesel autocatalysts became feasible.

Substitution and platinum automotive demand growth

Demand, supply and the associated cost of purchasing PGMs for autocatalysts also impact usage. For example, the spike in the price of palladium in 2000, at a time when more palladium was being used annually in vehicles than was being mined, resulted in platinum substituting palladium.

Notwithstanding the economic disruption caused by the COVID-19 pandemic, the PGM market today - and indeed from 2017, since when the price of palladium has exceeded that of platinum - is experiencing a similar imbalance, with annual automotive palladium demand exceeding mined supply and sustained palladium deficits being seen. This has led to a distortion between the price of platinum and palladium, with the latter currently trading at a price premium of over US$1,000/oz.

The high price, sustained demand growth and limited supply growth of palladium is making material platinum demand growth due to substitution of some palladium in gasoline cars extremely likely, as the recent BASF and Johnson Matthey announcements demonstrate.

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