

PGM catalyst demand staying strong

Fine chemicals, hydrogen production to become main drivers as automotive declines

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Emission control catalysts have traditionally been the main application area of global consumption of platinum group metals (PGMs) for catalysts, but as the automotive industry transitions from internal combustion engine (ICE) vehicles to electric vehicles (EVs), demand for PGMs will decline. However, demand for precious metal catalysts will remain strong, with growth potential seen in alternative applications such as fine chemicals and hydrogen production.

Umicore SA (Brussels) expects the use of PGMs for automotive catalysts to decrease over time as the utilization of ICEs declines. However, that means the availability of PGMs for other applications will open up, Phillip Chalabi, director/strategic projects and innovation at Umicore, told CW. "I think it is important that we look at that as an opportunity," he said.

Fine chemicals for pharmaceuticals are a growing area for PGM catalysts, even though they have been used in these applications for a long time, Chalabi said. The prevalence of catalysis in fine chemical production is extremely high, and the majority of these catalytic reactions are PGM driven, he said.

"PGMs have been used in fine chemicals for pharma for many years. They are used as cross-coupling agents, in metathesis chemistry, in asymmetric hydrogenation and numerous other catalytic chemistries. PGM catalysts can do chemistries that other catalysts cannot do as efficiently, due to the ability of the substrate functional groups to interact with the precious metal to facilitate reactions that would otherwise not take place or not take place sufficiently," Chalabi said.

Demand for precious metals such as platinum, palladium and rhodium for catalytic converters, currently the largest application for PGMs, is expected to decrease as the automotive industry moves toward fossil-free options, Dominik Sperzel, global head of sales/heterogeneous catalysis and vice president of Heraeus Holding GmbH's (Hanau, Germany) precious metals business, told CW.

The declining demand in this field, however, does not mean the end of "significant" demand



SPERZEL: PGM market is returning to normal after COVID-19, supply-demand shocks in 2021.



CHALABI: Demand from automotive sector expected to decline over time as EVs replace ICE vehicles.

for these metals, Sperzel said. Heraeus is seeing demand growth for its emission catalyst specialty products due to stricter regulations and new application fields such as the emerging hydrogen economy, he said.

"While the roles of PGMs as catalysts in [proton exchange membrane (PEM)] ... electrolyzers and PEM fuel cells is well known, there are many more opportunities for platinum, iridium and ruthenium, plus palladium, too, though to a much lesser extent for rhodium," said Sperzel.

There are options for using PGMs in the midstream of the hydrogen value chain, Sperzel said. Transport and storage are the "vital" link between the upstream electrolytic production of green hydrogen via renewables and the downstream use of hydrogen as an energy carrier, he said. Meanwhile, the circular use of precious metals through recycling is increasingly important to reducing the carbon footprint and enhancing supply security, Sperzel noted.

In addition, the pharma fine chemicals segment is a major user of precious metal catalysts, he said. They are used in hydrogenation, isomerization, oxidation or cross-coupling reactions due to their unique properties such as high catalytic activity and selectivity, Sperzel said.

"They are an ideal choice for synthesizing complex molecular structures with high purities and yields. The use of catalysts in these processes is crucial, as it can significantly reduce the time and cost required to produce compounds," he added.

According to Bettina Munsch, head of Evonik Industries AG's life science and performance catalysts product line, fine chemicals production always has been and will remain an application for precious metal catalysts with an "attractive growth rate."

Precious metals availability

Platinum supply is forecast to fall short of demand in 2023, according to Johnson Matthey's latest PGM market report in May. Demand for platinum is forecast to rise by almost 20% in 2023, with investment returning to positive territory after two years of investor selling as the use of platinum in automotive catalysts for gasoline engines gains momentum, the report said.

Combined primary and secondary platinum supply is expected to grow by 5% as vehicle recycling rates start to improve and South African producers treat backlogs that accumulated during recent smelter maintenance, according to analysis in the report.

"Consumption in industrial applications is expected to remain firm, despite temporary weakness in the [liquid-crystal display] ... glass sector, hit by a downturn in consumer electronics," it said.

PGMs supply is highly concentrated, with South Africa and Russia the largest primary producers globally. Meanwhile, the market for PGMs is in the process of returning to normal after the COVID-19 pandemic, the automotive semiconductor chip shortage and the 2021 supply-demand shocks due to a Russian PGM production shortfall, as well as the war in Ukraine, Sperzel said.

Heraeus, however, did not face difficulties securing precious metal supplies during this

period, Sperzel noted. The company's global footprint and its "strong" recycling activities have helped to mitigate supply-chain disruptions, he said. Slower economic growth is predicted in many regions in 2023, which would weigh on metal demand, he added.

Umicore, as one of the world's largest precious metal refiners, also had no issues with access to precious metals, Chalabi said. "Umicore did not experience any significant PGM supply issues during the COVID-19 pandemic. Prices certainly fluctuated, as they are affected by the demand-supply relationship, but availability was not substantially impacted," he said. "For Umicore, being a major provider of refined precious metal has allowed us to consistently maintain a stable access to precious metal for our business partners. The supply security of most PGMs will continue well into the future in conjunction with the slow but steady decline of internal combustion engines, and it is predicted that this could lead to lower precious metals prices in the future."

Meanwhile, demand for certain PGMs from other industries, such as electronics, is steadily increasing, including demand for ruthenium in sensors and circuits, Chalabi said. PGMs are also used in cell phones, tablets, computers and many other electronic devices, he said. Hydrogen fuel-cell technology for fuel-cell EVs is another important and growing area, as the electrodes of the fuel cell require PGMs, Chalabi added.

"There will always be a place for PGMs in the chemical industry because of the inherent advantages they offer," he said.

Evonik did not have any difficulty sourcing precious metals during the pandemic, and it did not face any supply-chain issues, Munsch said. Most of the precious metal in a catalyst is used in circularity — it is reclaimed from spent catalysts and re-used in the manufacture of fresh catalysts — so the demand for fresh precious metals is very small, Munsch stated.

Recycling, refining of PGMs

All precious metal catalysts used in the chemical and petroleum industry are being recycled for economic and sustainability reasons, Munsch said. Evonik has been well established in this market for many years and is striving to strengthen this position, she said. "Our driver is to support our customers in their sustainability targets and needs, and offering an economical and beneficial solution at the same time," she added.

Heraeus is the largest recycler of PGMs globally, with a production footprint across all

major regions, Sperzel said. Recycling "means" sustainability because raw material resources will not last forever, he added.

"Recycling makes a considerable contribution to protecting the environment by having a CO₂ footprint up to 98% lower than primary supply. By offering our customers metal from recycled sources, we help them to reduce their Scope 3 CO₂ footprint," he said.

Recycling also "means" money, since precious metals are too valuable to waste, according to Sperzel. Recycling of chemical and petroleum catalysts is an important segment for Heraeus, and the company recently announced that it would invest €35 million in its recycling activities as part of a global investment program worth €300 million.

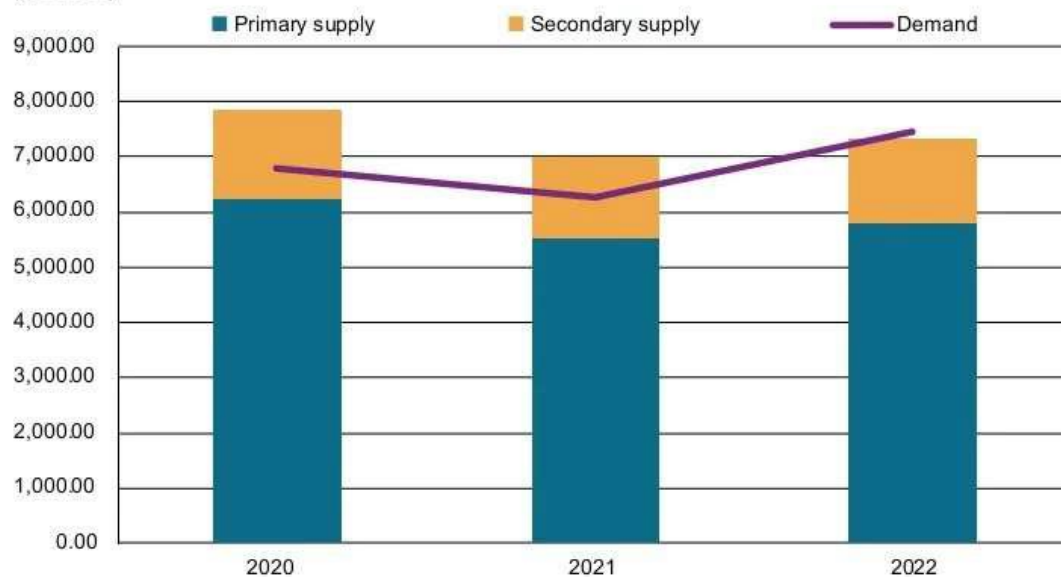
Umicore's Chalabi told CW that there is "certainly" room for refining to grow, as a "surprisingly" low percentage of the total PGM used today gets refined. "To be truly sustainable and to support a circular economy, it is essential that a much higher percentage of the PGMs that are utilized are recovered, refined and returned to the metal supply chain," Chalabi said. "In



MUNSCH: Economic and sustainability reasons drive recycling of precious metal catalysts.

metal prices in the first quarter of 2022, Sperzel said. "Gold and silver reaped the status of their safe havens as the geopolitical tensions escalated, and concerns over the availability of Russian metal pushed the palladium price to a new all-time high in March 2022. However, with the conflict rumbling on and Russian PGMs still reaching the market, the gold, silver and PGM prices have spent the rest of the year returning to lower levels," Sperzel stated.

Platinum supply-demand (In 000 oz)



Total combined (primary and secondary) supply of platinum versus total demand between 2020 and 2022.
Source: Johnson Matthey PGM Market Report (May 2023)
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addition, with prices of PGMs as high as that of rhodium, for example, you want to collect every bit of material you can possibly recover and refine it rather than having to purchase fresh metal again. So, sustainability is as much an economic driver as it is a social one and I think it is just absolutely critical to your business model."

PGM price trends

The war in Ukraine spurred a rally in precious

Prices of precious metals have dropped significantly in 2023, especially for palladium, which is now half the price of the record high seen in March 2022, according to Munsch. Palladium prices are very much dependent on the automotive industry, since palladium is mainly used in emission control catalysts, and this demand weakened with the recent slowdown of the economy, Munsch said. As a result, the price of palladium, as well as the price of platinum, have declined, she said. ■