

More valuable than gold, what's next for palladium?

What is palladium, and why is everybody getting excited about palladium?

Palladium is a chemical element with symbol Pd and atomic number 46. It is a rare and lustrous silvery-white metal discovered in 1803. Palladium, platinum, rhodium, ruthenium, iridium and osmium form a group of elements referred to as the platinum group metals (PGMs). These have similar chemical properties, but palladium has the lowest melting point and is the least dense of them. It does not react with oxygen in normal temperature. Palladium can resist chemical erosion, intense heat and is electrically stable.

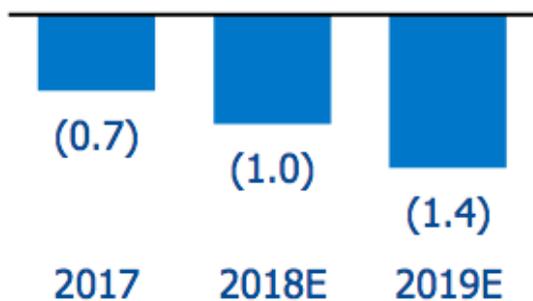
Palladium is a so called sister-metal to platinum and it is used mostly in car catalytic converters, and in electronic components, jewelry, and surgical instruments.

As of March 7, 2019 the price of palladium was USD 1,545/0z, higher than gold at USD 1,288/0z. Palladium prices are up 58% in the past year, making it a star performer.

Palladium demand versus supply

Palladium is considered a precious metal, and as a result, prices can fluctuate depending on supply and demand forces, as what we are seeing now. On the demand side, tightening auto-emissions rules are requiring larger volumes of platinum-group metals in exhaust catalysts. Manufacturers whose converters at present use more palladium than platinum are likely to take several years to switch back to the cheaper metal, which will continue to keep prices high.

Palladium deficit forecast in 2019



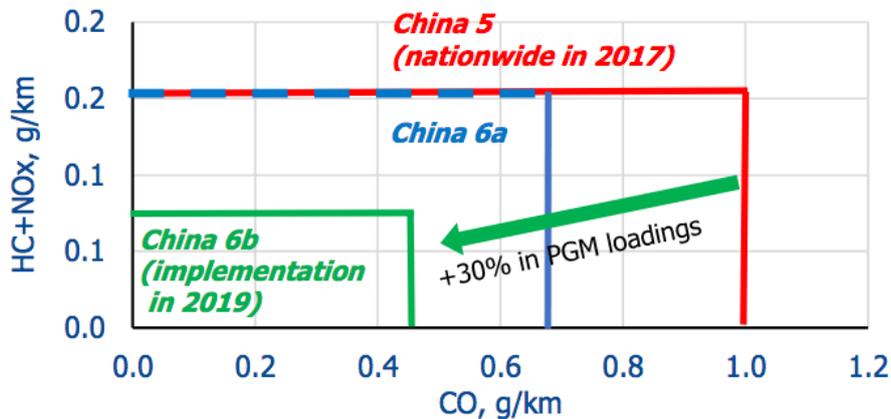
Palladium deficit forecast in 2019

For this reason alone we have this year's best performing commodity in palladium. The total primary refined palladium output in 2017 was around 7.54 million ounces or approximately 214 tons. Demand for palladium auto-catalysts has increased investment demand and awareness for the precious metal.

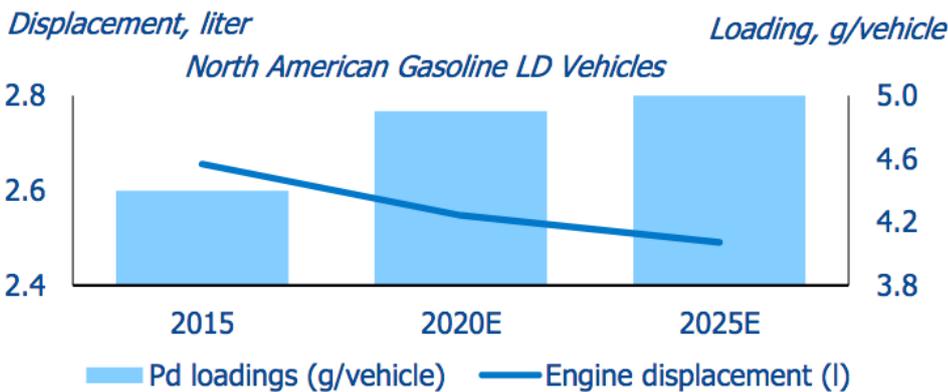
Reducing CO2 emissions requires more palladium

China: China 6 Regulation Pushes OEMs to Increase PGM Loadings

Tightening NOx and CO Targets in China



USA: Pd Loadings Expected to Rise on Stricter Emission Regulations Despite Engine Downsizing



Reducing CO2 emissions requires more palladium

MMC Norilsk Nickel is the world's largest producer of palladium (41%), producing a total of 3,500,000 oz of palladium in 2017. The company extracts precious and platinum group metals as by-products from its nickel mines. Norilsk, Russia's largest mining company also extracts and refines cobalt, silver, gold, tellurium, and selenium as by-products.

Anglo American Platinum Limited is the world's second largest palladium producer, producing 1,600,000 oz in 2017. Anglo American has mines across South Africa and in Zimbabwe.

Impala Platinum Holdings Limited (Implats) operations are

focused around the Bushveld Complex in South Africa and the Great Dyke in Zimbabwe. Implats produced 849,000 oz of palladium by the end of the company's fiscal year on June 30, 2018.

Lonmin produced 330,000 oz of palladium in 2017. The company's primary operations, the Marikana Mine, is located on the western limb of the Bushveld complex. Lonmin also produces base metals, including copper and nickel, and other platinum group metals.

Sibanye Gold Limited's palladium production of 260,000 oz is done through Stillwater, which main assets are located along the 28-mile-long J-M Reef ore body in Montana. The location consists primarily of palladium, platinum and a minor amount of rhodium.

Vale SA is the world's largest second-largest mining company. Vale produced 250,000 oz of palladium in 2017, as a by-product of its nickel refining process.

Northam is an integrated PGM producer with operations focused around the Bushveld Complex in South Africa. The company's primary facility extracts roughly 300,000 oz of PGM concentrate annually.

North American Palladium is a primary palladium producer. The LDI mine is currently undergoing expansion with North American Palladium targeting a production level of 250,000 from its current 200,000 oz of palladium per year after completion.

Of the top 8 palladium producers it's easy to see the majority of producers come from one region in South Africa, and the palladium bubble is not going to burst overnight. New projects out of South Africa could take years to get up and running, before we see any major changes in current prices from over-supply.