



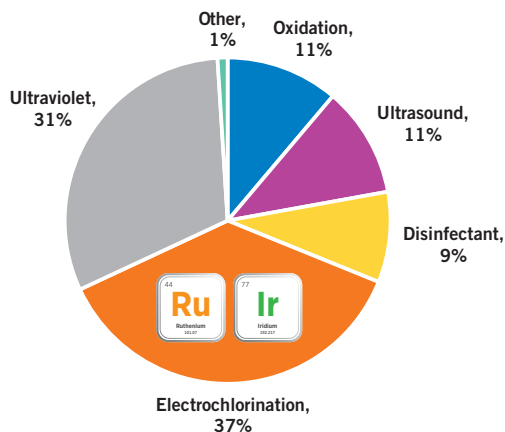
MARKET SPOTLIGHT

Shipshape: strict ballast water legislation drives iridium & ruthenium demand

Between 2019 and 2024, an estimated 40,000 vessels will have to install new ballast water treatment systems (BWTS) to continue operating, supporting demand for iridium- and ruthenium- based electrochlorination systems. The International Maritime Organization (IMO) Ballast Water Management Convention was implemented in September 2019 and all vessels weighing more than 400 gross tons will need to be fitted with a compliant and approved BWTS by September 2024 at the latest.

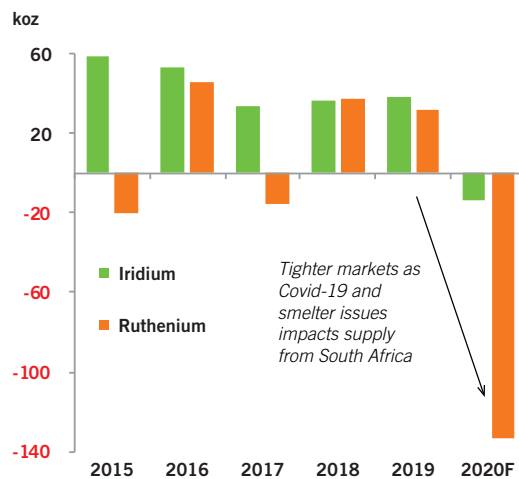
Electrochlorination is the favoured method of ballast water treatment, accounting for over a third of all installed systems worldwide (source: DESMI). It uses iridium- and ruthenium-coated electrodes to produce dilute sodium hypochlorite (bleach) in situ. The electrodes degrade over time, generating regular top-up demand for the metals. Demand for iridium and ruthenium in electrochemical applications amounted to 62 koz and 180 koz respectively last year but has been disrupted in 2020 owing to weakness in certain downstream products' requirements, such as PVC in the construction industry. However, demand for electrodes is forecast to continue through the early 2020s, with year-on-year growth forecast over the longer term as well.

Ballast water treatment technologies



Source: SFA (Oxford), DESMI

Iridium and ruthenium: market balances



Source: SFA (Oxford)

The necessary ballast water treatment upgrades have been driving activity at repair yards this year, as ship operators took the opportunity to carry out refits while global shipping levels were lower owing to the pandemic. However, the main wave of refits and installations is expected to peak in 2022, with an estimated 15,000 BWTS installed, and therefore manufactured, in that period (source: DNV GL).

The iridium and ruthenium markets have both experienced tightness this year as the impact of Covid-19 plus smelter issues in South Africa have affected supply and pushed both markets into deficit. Iridium supply, in particular, which has the longest processing time of all the PGMs, is set to be significantly impacted well into 2021. Work-in-progress stock is forecast to boost refined output next year.



PRECIOUS METALS REVIEW

79 Au Gold

	Close	Weekly change	High	Date	Low	Date
\$/oz	1,833	2.72%	1,848	04/12/2020	1,765	30/11/2020
€/oz	1,510	1.14%	1,521	03/12/2020	1,473	30/11/2020

Festival demand in India has helped to lift gold retail sales in some regions. Retail demand for gold improved in October owing to a lower gold price and seasonal demand around the festival of Navrati, one of the auspicious festivals in the Hindu calendar. Jewellers in some southern states reported sales growth ranging from 5-15% year-on-year during Navrati this year (17-25 October). Retailers in some tier 2 and tier 3 cities also reported strong sales owing to demand from rural consumers. However, during the festival of Diwali in November, retailers reported sales in volume terms down compared to last year owing to the much higher gold price. Indian

consumer demand fell 30% year-on-year to 86.6 tonnes in Q3'20 (source: World Gold Council), taking demand for the first nine months of the year to a record low of 252.2 tonnes (-49% year-on-year). Despite the glimmer of hope in the form of festival and wedding demand in Q4, the consumer market is forecast to contract by at least a third this year. The sharp rally in the gold price last week may indicate that it has ended its correction. The dollar has been weakening for a month but only last week did gold start to rally. Perhaps that leaves room for more upside as gold catches up.

47 Ag Silver

	Close	Weekly change	High	Date	Low	Date
\$/oz	24.10	6.52%	24.41	04/12/2020	21.99	30/11/2020
€/oz	19.85	4.88%	20.17	02/12/2020	18.35	30/11/2020

Physical silver demand was mixed in November. Silver ETF holdings dropped by 13 moz, but at 4.8 moz coin sales in the US had their best month since March.

The silver price accelerated higher last week. If gold has resumed its larger uptrend then silver can continue to outperform. With the gold:silver ratio at 76 it is still comfortably above its long-term average of 65, so there is room for the gold:silver ratio to narrow further.

78 Pt Platinum

	Close	Weekly change	High	Date	Low	Date
\$/oz	1,060	9.83%	1,082	04/12/2020	958	30/11/2020
€/oz	873	8.07%	889	04/12/2020	799	30/11/2020

Chinese consumers are attracted by platinum's price discount to gold. Platinum Guild International's (PGI) retail partners reported healthy demand for platinum jewellery in Q3'20, with sales growing by 5% year-on-year, according to PGI's latest Business Review. Deterred by the negative impact of a high gold price and slow turnover of gold items, many retailers began to increase their platinum stocks last quarter. Platinum jewellery fabrication rose by 13% year-on-year in Q3, owing to new collections from leading brands, new interest from distributors and smaller retailers, and a rebound in bridal demand. This was a marked improvement from the 56% year-on-year decline recorded in Q1 and the modest

1% year-on-year increase in Q2 (source: PGI). A strong economic rebound in mainland China continues to boost the recovery of the world's largest platinum jewellery market, with total jewellery sales rebounding by an impressive 16.7% year-on-year in October (source: NBS). However, the collapse in sales in the first half of the year means Chinese platinum jewellery demand is still forecast to contract by 23% in 2020, to around 730 koz.

With platinum priced above \$1,000/oz, lease rates have been edging up, indicating a degree of tightness in the market. However, given the large industrial market surplus, gains should be viewed with caution.



PRECIOUS METALS REVIEW

⁴⁶Pd Palladium

	Close	Weekly change	High	Date	Low	Date
\$/oz	2,359	-2.79%	2,437	01/12/2020	2,228	03/12/2020
€/oz	1,943	-4.37%	2,031	01/12/2020	1,866	03/12/2020

Nornickel's palladium output is set to grow modestly in 2021. Nornickel is the largest producer of palladium with guidance for production of 2,648-2,777 koz this year. After the first three quarters of the year, palladium output was 2,053 koz, so the company could easily meet the upper end of its guidance with a typical level of production in Q4. The company states output will grow by 2-5% in 2021. Next year, palladium supply from South Africa is expected to be boosted by the processing of stock built up as a result of Anglo American Platinum's smelter outage. Therefore, the palladium market could have a smaller deficit than this year even with the anticipated recovery in light-vehicle sales. In the near

term, with refined output somewhat restricted, the price could continue to hold above \$2,200/oz.

Nornickel has long-term growth plans which will lift palladium production. For the near term, the company has completed a feasibility study on its South Cluster project. Open-pit ore mining is scheduled to start in Q2'21. For the longer term, the company plans to increase the amount of ore it mines in 2025 to 24-26 mt/a, 14% higher than the 21-23 mt/a announced last year. This should result in steadily expanding palladium output.

⁴⁵Rh ⁴⁴Ru ⁷⁷Ir Rhodium, Ruthenium, Iridium

	Rhodium	Ruthenium	Iridium
Reporting week	\$16,650/oz	\$295/oz	\$1,715/oz
Previous week	\$16,300/oz	\$295/oz	\$1,670/oz

Iridium's green credentials catch the eye of investors. AP Ventures has invested in HPNow, a novel hydrogen peroxide production technology which uses an iridium catalyst. Hydrogen peroxide is one of the world's most widely used chemicals. Its applications range from agriculture, healthcare and water treatment, and it is traditionally produced from fossil fuels. Using only electricity, water and air, HPNow enables clean, scalable, in-situ production of hydrogen peroxide through the process of electrochemical synthesis. AP Ventures is a capital fund which invests in companies

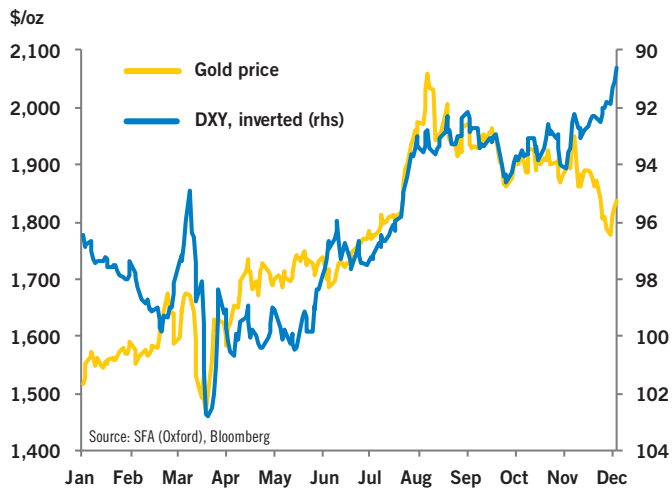
that either utilise or enable the use of PGMs, with an existing portfolio spanning the hydrogen value chain. Electrochemical technologies, in which varying combinations of iridium and ruthenium make robust catalytic coatings, are finding increasingly wider applications in the global transition to a cleaner future.

The ruthenium price remained unchanged last week, while rhodium and iridium nudged up to new record highs of \$16,650/oz (+2.1%) and \$1,715/oz (+2.7%) respectively.



TRENDS AND INVESTMENTS

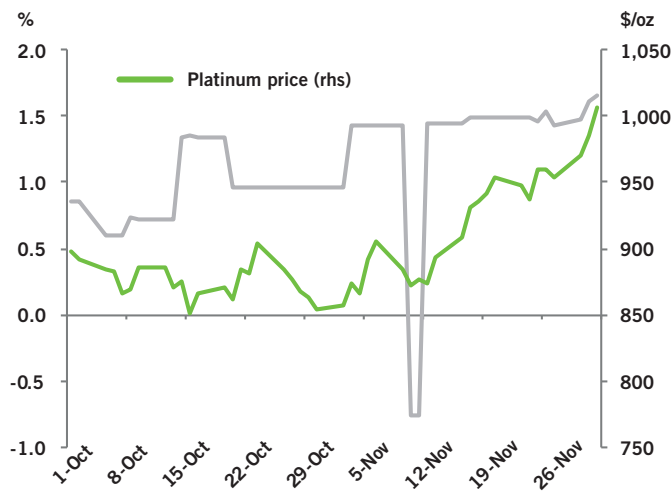
Gold vs. dollar



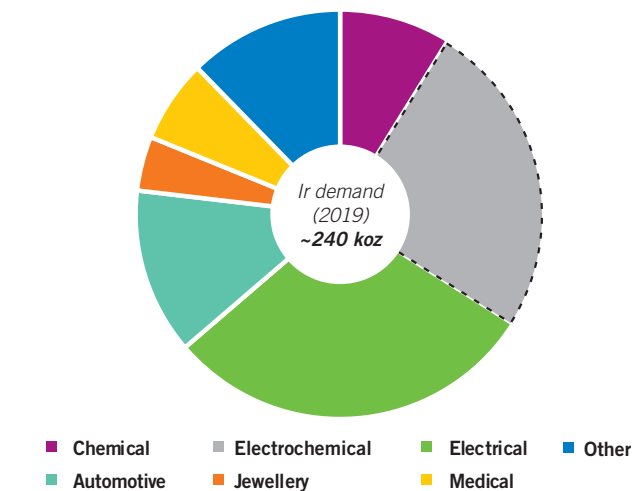
Gold and platinum prices at SGE



12m platinum lease rates



Iridium demand by end-use



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