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(Part- II : Metals & Alloys)

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PLATINUM AND PALLADIUM

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GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

Indira Bhavan, Civil Lines,
NAGPUR – 440 001

PHONE/FAX NO. (0712) 2565471
PBX : (0712) 2562649, 2560544, 2560648
E-MAIL :cme@ibm.gov.in
Website: www.ibm.gov.in

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13 Platinum and Palladium

Platinum Group of Metals (PGM) is a family comprised of 6 metals–platinum, palladium, rhodium, iridium, osmium and ruthenium. They have similar physical and chemical properties and tend to occur together in the same mineral deposits. These six elements are classified into two groups with reference to the specific gravity of gold (19.2). The elements, Ru, Rh, Pd (sp. gr. 12–12.4) are lighter, while the other three specific gravity elements, Os, Ir and Pt are heavier than gold but within the range of 21.0–21.5. Platinum is an extremely rare metal occurring at a concentration of only 0.005 ppm in earth's crust. Major applications of platinum and palladium are in Automotive Sector for emission control and in chemical and petroleum refining.

RESERVES/RESOURCES

Reserves/Resources of PGM in the country as on 1.4.2020 as per NMI Database, based on UNFC System, are placed at 20.92 tonnes of metal content. By State, Odisha alone accounts for 67% of country's resources of PGE followed by Uttar Pradesh (13%) and Tamil Nadu (8%) with negligible amount (Table-1).

Boula-Nausahi, a 3 km-long belt, 170 km NE of Bhubaneswar, Odisha, is the only proven Platinum Group of Metals (PGM) deposit in the country. Preliminary assessment of PGMs in Sukinda ultramafic field indicated isolated anomalous values in chromite. Platinum values of 2 to 400 ppb and palladium values of 1 to 500 ppb were established on analysis. The limonite cappings over ultramafic rocks showed combined platinum and palladium values between 40 and 290 ppb. In Boula-Nuasahi ultramafic complex, the easternmost chromite band known as Shankar-Ganga load, investigations revealed potential PGM mineralisation. In Sittampudi Complex, Salem district, Tamil Nadu, analysis of chromite bands showed 0.03 to 0.75 ppm Pt and 0.1 to 1.0 ppm Pd, whereas amphibolite samples showed 0.03 to 0.05 ppm Pt and 0.03 to 0.5 ppm Pd. A platinum-rich chromite-ferro-chromite breccia zone stretching to about hundred metres in gabbroic matrix was identified in the southern extension of the already known Boula-Nuasahi area in Kendujhar district, Odisha. In Usgaon area, Southern Goa, PGM samples analysed up to 0.03 ppm Pt and 0.03 to 0.15 ppm Pd. In recent past, occurrences of PGE mineralisation were reported in mafic-ultramafic complex of Shivamogga schist belt in Davanagere district of Karnataka. Three zones having 10 to 830 ppb of platinum and 50 to 1500 ppb of palladium were established (Table-1).

EXPLORATION & DEVELOPMENT

The exploration and development details, if any, are covered in the Review on Exploration & Development under "General Reviews"

USES

China and India are moving forward with large-scale plans to reduce the amount of carbon emission in their respective countries. Currently, more than half of platinum and palladium mineral goes into making catalytic converters in automobiles. Automobiles that run on diesel predominantly use platinum for catalytic conversion. Platinum-cured silicones are used to coat and protect automotive air

Table – 1: Reserves/Resources of PGM as on 1.4.2020(P)

(In tonnes of metal content)

State	Reserves Total (A)	Remaining resources				Total Resources
		Indicated STD 332	Inferred STD 333	Reconnaissance STD 334	Total (B)	Total (A+B)
India	**-**	**11.66**	**7.4**	**1.86**	**20.92**	**20.92**
Karnataka	-	-	-	1.5	1.5	1.5
Kerala	-	-	0.18	-	0.18	0.18
Odisha	-	7.7	6.5	-	14.2	14.2
Tamil Nadu	-	0.61	0.72	0.36	1.69	1.69
Uttar Pradesh	-	3.35	-	-	3.35	3.35

Figures rounded off

bags from their explosive system. The air bags contain an initiator senser, which uses a fine platinum wire coated with explosive material to facilitate release of the air bag. The chemical inertness and refractory properties of these metals are conducive for their applications in electrical, electronics, dental, medical fields and in the Glass Industry. These metals are also used as catalyst in various chemical processes, viz, in organic synthesis in hydrogenation, de-hydrogenation and isomerisation, production of nitric acid, the raw material for the manufacture of fertilizers, explosives & polymers and fabrication of laboratory equipment.

In addition, platinum, palladium and a variety of complex gold-silver-copper alloys are used as dental restorative materials. The non-corrosive and non-allergic properties of platinum find varied applications in the medical field. Platinum's excellent compatibility with living tissue unaffected by the oxidising reaction of blood, enables its utility in pacemakers.

The primary usage of PGM is in chemotherapy for treatment of cancer. It has the ability to prevent division of certain living cells, a remarkable characteristic which finds profound application in treatment of cancer. Besides, platinum-iridium alloys are extensively used in prosthetics and biomedical devices.

Platinum's excellent conductivity lends itself for use in the electrodes of phosphoric acid fuel cells for generating electricity. Another significant use of platinum and its alloys, in cast or wrought form is in jewellery. Platinum-iridium alloys find major application in making crucibles for growing crystals. Glass made with platinum and rhodium is used in housing construction, flat screen televisions, computer monitors, display panels, automobile displays, factory monitoring equipment, etc. Recently, a new metallic glass featuring micro-alloys of palladium with silicon, germanium, silver, etc. was reportedly developed at University of California. The glass is characterised by strength and toughness. Platinum is used to enhance storage capacity of devices, such as, computer hard discs, cellphones, digital cameras and personal music players. Recently, palladium-silver resistors have been used in secondary lightning surge protection devices. In Electronic Industry, palladium's use is for Multi-Layer Ceramic Capacitors (MLCC). The effect of miniaturisation of MLCC has not reduced the quantum of palladium used as more number of MLCC are required for the same electronic device. Platinum-based fuel cells are proving to be more cost effective, cleaner and more reliable than alternatives, such as, diesel generators.

Rhodium usage is also on the rise in the Automotive Industry apart from fibre glass. Platinum is the catalyst used by fuel cells to convert hydrogen and oxygen to electricity.

Palladium is also likely to play a role in fuel cells. Platinum acts as an effective and durable catalyst in hydrogen-powered Fuel Cell Electric Vehicles (FCEVs).

SUBSTITUTES

Platinum and palladium are two of the most expensive metals on the planet. Platinum is currently about 30% more expensive than gold while palladium is about half the cost of gold. It is usually easier to substitute metals of the platinum group for one another, especially in alloys, than to use alternative materials, which is evident from the total dominance of ruthenium-based resistors over the palladium-silver resistors for high-powered applications. Substitutes in electrical use include tungsten, nickel, silver, gold and silicon carbide. Alternative catalysts include nickel, molybdenum, tungsten, chromium, cobalt, vanadium, silver and rare earths. Rhenium, however, has been used most satisfactorily as substitute for platinum as a catalyst in petroleum refining. Stainless steel and ceramics can be substituted where resistance to corrosion is the primary concern. Some motor vehicle manufacturers have substituted platinum by palladium in catalytic converters, especially for petrol engines. Particulate matter and residual sulphur contaminate palladium

and hence, it was excluded from catalysts used in diesel vehicles. A new technology now allows up to 25% substitution of platinum in diesel catalytic converters with palladium.

Similarly, manufacturers of electronic parts are also reducing the average palladium content of the conductive pastes used to form the electrodes of multi-layer ceramic capacitors, substituting base metals or silver-palladium pastes which contain significantly less palladium.

Rhenium, tungsten and molybdenum as substitute for platinum in aeromatics hydrogenation catalysts have been investigated. Recently, a new type of iron and carbon-based catalysts has been discovered which is stable and active in both acidic and alkaline media and may even eliminate the need of platinum in catalysts and thus revolutionise the Proton Exchange Membrane Fuel Cell (PEFC) Industry.

TECHNICAL POSSIBILITIES

The spent converters contain platinum and palladium in 3:1 ratio, but heavy shift towards use of palladium to meet stringent emission controls will change this proportion of recovery.

The emergence of Polymer Electrolytic Membrane (PEM) fuel cells developed for passenger cars and trucks will boost prospects of platinum in near future by replacing the high energy battery-operated options for emission controls. The costs of higher range of driving and quick refuelling of fuel cells are, however, 10 times more than the cost of petrol engine.

The development of Solid Oxide Fuel Cell (SOFC) in Japan will eliminate the use of platinum converter as it is compact and gives consistent performance as conversion of conventional fuels into hydrogen is avoided.

Recycling is a significant factor in the supply of many of the metals used in our society. It plays an important role in lowering the environmental foot-print of global PGM production. Over 95% of the PGM content of spent automotive catalysts can be repeatedly recovered. Cellphones are one of the major sources of secondary metals. Falconbridge Ltd estimated that in 1 tonne of obsolete cellphones (excluding batteries) the average palladium and platinum was about 130 g and 8 g respectively.

RESEARCH & DEVELOPMENT

The Mineral Processing Department of the Institute of Minerals & Material Technology (IMMT), Bhubaneswar (CSIR) had envisaged projects to pursue research focused on recovery of PGE values from the low tenor hosts like Boula-Nuasahi igneous complex by adopting suitable beneficiation tests and development of process flow sheet for recovery of PGE from Indian ores. The methods adopted elsewhere in the world perhaps may not suit in India because the PGE occurs in oxide of chromium and sulphide facies in very fine inclusions & exsolution form.

Bench-scale beneficiation of low-grade PGM samples from T2 sector, Tasampalayam block in Sitampundi Anorthosite complex in Tamil Nadu for GSI was carried out at the Modern Mineral Processing Laboratory and Pilot Plant, IBM, with the objective of enriching platinum group metal present in the sample and to envolve a suitable process flow sheet for recovery of PGM concentrate and chromite. The study indicated that the samples are amenable to beneficiation to produce platinum group of minerals.

WORLD REVIEW

The world reserves of PGM are estimated at 70,000 tonnes concentrated mostly in South Africa (90%) followed by Russia (6%), Zimbabwe (2%) and USA (1%) (Table - 2).

World mine production of PGMs decreased slightly by 7% to 430 tonnes of metal content in 2020 from 461 tonnes of metal content in 2019 (Table-3).

South Africa, which accounted for 52% of the

Table – 2 : World Reserves of Platinum Group Metals (By Principal Countries)

(In kilograms of PGM content)

Country	Reserves
World: Total (*rounded off*)	**70,000,000**
Canada	310,000
Russia	4,500,000
South Africa	63,000,000
USA	900,000
Zimbabwe	1,200,000
Other countries	NA

Source: *USGS.Mineral Commodity Summaries, 2022,*

total PGM mine production in 2020 was followed by Russia (27%), Zimbabwe & Canada (7% each), USA (4%) while other countries contributed the remaining 3 percent.

Table – 3 : World Mine Production of PGMs (By Principal Countries)

(In kilograms of metal content)

Country	2018	2019	2020
World:Total (rounded off)	**469000**	**461000**	**430000**
South Africa			
Platinum	137053	132989	111993
Palladium	80629	80684	66264
Other platinum metals	52964	54395	46835
Russia			
Platinum [(a)]	23800	22100	23500
Palladium[(a)]	85300	86600	92300
Other platinum metals[(a)]	2100	2100	2000
Zimbabwe			
Platinum	14703	13857	15004
Palladium	12094	11639	12890
Other platinum metals	3076	2800	3230
Canada[(e)]			
Platinum[(e)]	11000	10300	10700
Palladium[(e)]	19200	17900	18600
Other platinum metals[(e)]	1300	1200	1200
USA			
Platinum	4160	4150	4200
Palladium	14300	14300	14600
Other platinum metals	100	100	100
China			
Platinum	2500	2500	2500
Palladium	1300	1300	1300
Other countries			
Platinum	1593	973	1306
Palladium	1760	1289	1487
Other platinum metals	-	-	-
Grand Total	**469202**	**461352**	**430419**

Source: *BGS, World Mineral Production, 2016-2020.*

(a) Sales from mine production and stocks.

(b) Years ending 7th July of that stated.

To provide a generalised view of the development in various countries, the countrywise description, as sourced from the latest available publication of Minerals Yearbook 'USGS' 2018, is furnished below:

Canada

In October, North American Palladium Ltd announced the results of a new feasibility study for its Lac des Iles Mine in northwestern Ontario. The report extended mine life by 1 year to 2027 with the average ore production rate doubling to 12,000 metric tonnes per day. In December, North American Palladium Ltd announced that it had entered into a contract with mining engineering firm Redpath Canada Ltd for a major expansion project for the Lac des Iles Mine. The mine development was predicted to take 2 years to complete.

China

On September 12, Heraeus Precious Metals GmbH & Co. KG announced the opening of its new precious-metals plant in Nanjing, Jiangsu Province. The facility would increase the company's precious-metals and chemical products refining and recycling capacities, especially for PGMs. Its recycling rate and chemical production capacity were expected to increase to 3,000 metric tonnes per year (t/yr) and threefold, respectively (Heraeus Precious Metals GmbH & Co. KG, 2018).

Russia

In 2018, PJCS MMC Norilsk Nickel (Nornickel), a leading PGM producer in Russia, produced palladium and platinum at its two production assets in Russia—JSC Kolskaya Mining and Metallurgical Company (Kola MMC) on the Kola Peninsula and the Polar Division on the Taymyr Peninsula. Nornickel's PGM production decreased slightly compared with that in 2017 owing to a decrease in the amount of third-party material processed. In February, Nornickel and Russian Platinum LLC signed a deal to develop three PGM ore deposits in the Norilsk Industrial District in a 50–50 joint venture. The three deposits would produce a combined 70 to 100 t/yr of PGMs, 50,000 t/yr of nickel, and 70,000 t/yr of copper. A feasibility study was scheduled to be completed by the end of 2019, with the project beginning in 2020 and the first salable material expected in 2023.

South Africa

On April 2, six miners employed by African Rainbow Minerals Ltd were killed on their way to the Modikwa Mine. Since the beginning of 2016, more than 400 incidents of social unrest took place in the eastern portion of South Africa's platinum belt, according to data from Anglo American Platinum Ltd. The incidents were reportedly linked to conflicts between rival unions and grievances over jobs and revenue flows.

On August 2, Impala Platinum Holdings Ltd (Implats) published a strategic review of its Rustenburg operations in South Africa aimed at ensuring long-term profitability. The strategy would involve decreasing the operational mine shafts from 11 to 6 and cutting 13,000 jobs over the next 2 years. Annual production after the changes to operations was estimated to be 16,000 kg of PGMs, down from the current production of about 23,000 kg of PGMs. Implats clarified that the changes would affect only its Rustenburg operations and would not affect jobs at its mines in Zimbabwe.

Acquisitions of assets in South Africa that took place in 2018 included Northam Platinum Ltd's acquisition of Glencore plc's Eland platinum mine in January and Anglo American Platinum Ltd's acquisition of its joint-venture partners' shares in the Mototolo operations in November. Another new PGM project, the Waterberg joint venture, was announced by Platinum Group Metals Ltd, and a mining rights application was accepted by the South African Department of Mineral Resources in October. Other partners involved in the venture included Implats, Mnombo Wethu Consultants (Pty) Ltd, the Japan Oil, Gas and Metals National Corporation, Hanwa Co. Ltd, and Hosken Consolidated Investments Ltd.

Zimbabwe

In June, Zimplats Holdings Ltd (a subsidiary of Implats) announced that it had agreed to release 23,903 hectares of mining claims back to the Government of Zimbabwe. In 2013, the Government planned to compulsorily acquire a portion of Zimplats' mining claims to allocate to other investors, which the company initially opposed. Karo Mining Holdings Ltd was awarded mining rights to the land area. The Government of Zimbabwe announced plans to construct a base- and precious-metals refinery that would be capable of processing all platinum material mined within the country. The Government also planned to place a 5% tax on exported platinum concentrates beginning in 2019 to encourage domestic refining.

FOREIGN TRADE

Exports

Exports of platinum alloys and related metals increased by about 26% to 616 kg valued at ₹ 353.50 crore in 2020-21 from 604 kg valued at ₹ 168.16 crore in the previous year. Exports were mainly to UK (61%) and USA (10% each). Exports in 2020-21 comprised of platinum (unwrought) at 498 kg and platinum (others) at 46 kg. During 2020-21, exports of other metals of platinum group were 109 kg as compared to 345 kg during the preceding year while that of platinum-powder were 9 kg as compared to nil in the previous year (Tables- 4 to 9).

Imports

Imports of platinum alloys and related metal increased slightly by 15% to 10,719 kg valued at ₹ 3833 crore during 2020-21 as compared to 9,299 kg valued at ₹ 2580 crore in the previous year. Imports were mainly from UK (40%), Germany (15%), South Africa (14%) and USA (15%). Imports in 2020-21 comprised of platinum (powder, unwrought & others) at 5,148 kg, platinum (others) 3,676 kg and other metals of platinum group 1,859 kg. Imports of other metals of platinum group were mainly from UK (32%), USA & South Africa (15% each), Germany & Hong Kong (13% each) and Italy (6%). During 2020-21, imports of platinum-clad base (precious metals) increased by manifold to 73 kg as compared to 6 kg in the previous year. Imports were mainly from Italy (79%) and USA (13%). During 2020-21, imports of platinum powder were at 786 kg as compared to 666 kg in the preceding year. Imports were mainly from USA (68%) and Germany (19%) (Tables- 10 to 18).

Table – 4: Exports of Platinum Alloys & Related Metals: Total (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**604**	**1681684**	**616**	**3535012**
UK	297	801007	381	2798842
USA	31	60069	65	246419
Singapore	16	96301	14	240561
Japan	48	223676	8	195961
Italy	31	95619	16	35268
Germany	20	74142	1	15435
Cote D'Ivoire	-	-	++	1211
Baharain	++	35	++	638
Israel	++	592	1	358
Liberia	-	-	++	100
Other countries	161	330243	130	219

Figures rounded off

Table – 5 : Exports of Platinum (Unwrought) (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**259**	**524194**	**498**	**401315**
UK	64	62668	307	255329
USA	31	60069	60	143589
Cote D'Ivoire	-	-	++	1211
Baharain	++	35	++	638
Israel	++	592	1	318
Liberia	-	-	++	100
Bangladesh	-	-	130	93
Egypt	-	-	++	37
Switzerland	151	327648	-	-
Singapore	5	56760	-	-
Other countries	8	16422	-	-

Figures rounded off

Table – 6 : Exports of Platinum (Others)
(By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**197**	**641515**	**46**	**343359**
UK	141	426554	38	206137
Japan	8	52456	6	125985
Italy	23	79220	2	11235
UAE	-	-	++	2
Germany	20	62281	-	-
Singapore	5	21004	-	-

Figures rounded off

Table – 7 : Exports of Platinum (Powder)
(By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**-**	**-**	**9**	**151107**
Singapore	-	-	9	151107

Figures rounded off

Table – 8 : Exports of Other Metals of Platinum Group
(By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**345**	**1157490**	**109**	**2982590**
UK	233	738339	74	2543513
Japan	48	223676	8	195961
USA	-	-	5	102830
Singapore	11	39541	5	89454
Italy	23	79220	16	35268
Germany	20	74142	1	15435
Sweden	-	-	++	87
Israel	-	-	++	40
UAE	-	-	++	2
Hong Kong	10	2532	-	-
Other countries	++	40	-	-

Figures rounded off

Table – 9 : Exports of Platinum-Clad Base/Precious Metal (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**-**	**-**	**700**	**50**
Bangladesh	-	-	700	50

Figures rounded off

Table – 10 : Imports of Platinum Alloys and Related Metals : Total (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**9299**	**25809821**	**10719**	**38332024**
UK	3686	11602641	4307	15000141
Germany	968	3013894	1678	7732200
USA	1055	1650931	1632	7047110
South Africa	2082	6376221	1527	6584804
Italy	557	878768	486	862554
Russia	214	1086623	60	386469
Hong Kong	157	143135	745	343291
UAE	24	49410	62	161208
Japan	190	328280	39	98298
Czech Republic	14	49000	17	71696
Other countries	352	630918	166	44253

Figures rounded off

Table – 11 : Imports of Platinum (Powder, Unwrought & Others) (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**4705**	**10157862**	**5184**	**11561645**
UK	2057	4602109	2488	5415404
Germany	608	1262679	927	2114544
USA	245	515011	807	1742403
South Africa	1424	2992174	655	1493557
Italy	154	309459	144	374638
UAE	24	49410	62	161208
Japan	72	137296	37	86679
Czech Republic	14	49000	17	71696
Hong Kong	31	65198	22	49906
Russia	69	156165	19	41440
Other countries	7	19361	6	10170

Figures rounded off

Table – 12: Imports of Other Metals of Platinum Group (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**4594**	**15651959**	**5535**	**26770379**
UK	1629	7000532	1819	9584737
Germany	360	1751215	751	5617656
USA	810	1135920	825	5304707
South Africa	658	3384047	872	5091247
Italy	403	569309	342	487916
Russia	145	930458	41	345029
Hong Kong	126	77937	723	293385
Singapore	158	99086	40	29768
Japan	118	190984	2	11619
France	-	-	++	1942
Other countries	187	512471	120	2373

Figures rounded off

Table – 13: Imports of Platinum (Others) (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**3025**	**9724169**	**3676**	**19444680**
UK	929	3642359	1323	7413686
Germany	1	519	692	4715147
USA	686	660810	605	3481428
South Africa	608	3303033	543	2991103
Italy	403	569309	341	480220
Russia	145	930458	41	345029
Singapore	60	32359	10	8067
Japan	16	73624	1	5655
France	-	-	++	1942
China	160	1698	120	1880
Other countries	17	510000	++	523

Figures rounded off

Table – 14 : Imports of Platinum - Clad Base / Precious Metal (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**6**	**14483**	**73**	**42046**
USA	5	12444	10	33322
Spain	-	-	4	4014
Italy	-	-	58	2151
UK	1	2039	++	1552
Netherlands	-	-	1	795
Germany	-	-	++	212

Figures rounded off

Table – 15: Imports of Other Metals of Platinum Group (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**1569**	**5927790**	**1859**	**7325699**
UK	700	3358173	496	2171051
South Africa	50	81014	329	2100144
USA	124	475110	220	1823279
Germany	359	1750696	59	902509
Hong Kong	126	77937	723	293355
Singapore	98	66727	30	21701
Italy	-	-	1	7696
Japan	102	117360	1	5964
China	10	773	-	-

Figures rounded off

Table – 16- : Imports of Platinum–Unwrought (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**4039**	**8706425**	**4398**	**9874821**
UK	2057	4602015	2463	5355270
Germany	327	663692	772	1759798
South Africa	1161	2404616	606	1385586
USA	197	415505	269	619870
Italy	154	309459	144	374638
UAE	24	49410	62	161208
Japan	67	128169	37	86679
Czech Republic	14	49000	17	71696
Hong Kong	31	65198	22	49906
Singapore	3	5746	3	5868
Other countries	4	13615	3	4302

Figures rounded off

Table – 17: Imports of Platinum – Powder (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**666**	**1451437**	**786**	**1686824**
USA	48	99506	538	1122533
Germany	281	598987	155	354746
South Africa	263	587558	49	107971
UK	++	94	25	60134
Russia	69	156165	19	41440
Japan	5	9127	-	-

Figures rounded off

Table – 18 : Imports of Platinum-Clad Base/Precious Metal (By Countries)

Country	2019-20 (R)		2020-21 (P)	
	Qty (kg)	Value (₹'000)	Qty (kg)	Value (₹'000)
All Countries	**6**	**14483**	**73**	**42046**
USA	5	12444	10	33322
Spain	-	-	4	4014
Italy	-	-	58	2151
UK	1	2039	++	1552
Netherlands	-	-	1	795
Germany	-	-	++	212

Figures rounded off

FUTURE OUTLOOK

India is meeting its demand entirely by imports. The demand for PGEs is expected to touch 120 tonnes by 2025, as per the Report of the Sub-group for 12th Plan period.

As per PGM Market Report, May, 2021 of "Johnson Matthey Platinum Group Metals Service" PGM supply and demand fell in 2020, reflections covid related imports on the automotive, industrial and jewellery sectors. However demand for platinum is forecast to bounce back strongly in 2021. Indian platinum jewellery demand is most likely to expand following successful industry marketing and campaigns to promote the purchase of platinum jewellery sets as wedding gift.