

ZIRCON



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ZIRCON

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GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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29 Zircon

Zirconium is the twentieth most abundant element in the Earth's crust and occurs in a variety of rock types and geological environment but most often, in the form of zircon ($ZrSiO_4$) found usually as a constituent in heavy mineral sand assemblages, which include ilmenite, rutile, leucosene, monazite and garnet in varying proportions. Zircon sand and baddeleyite (an oxide- ZrO_2) are used via their salts to extract zirconium and hafnium. Normally, all zirconium compounds contain between 1.4% and 3% hafnium. Zircon is very stable at high temperature and has excellent thermal shock resistance, low thermal conductivity and chemical inertness. It finds use chiefly in industries like ceramic, refractory, abrasive, foundry, chemical and speciality alloys. Gem variety of zircon is used in jewellery. Ministry of Mines vide Notification No.S.O.2356 (E) dated 11.07.2016, zircon covered under beach sand minerals was inserted as entry 12 of Part B of the First Schedule to the MMDR Act, 1957.

Table – 1: Resources of Zircon

(In million tonnes)

State	Resources [#]
Total	33.71
Andhra Pradesh	11.94
Bihar/Jharkhand	0.08
Gujarat	0.01
Kerala	7.83
Maharashtra	0.01
Odisha	3.25
Tamil Nadu	10.20
West Bengal	0.39

Source: Department of Atomic Energy, Mumbai

:Inclusive of indicated, inferred and speculative categories. As per letter received from Department of Atomic Energy dated 26.07.2018.

RESERVES/RESOURCES

Zircon occurs in close association with other heavy minerals, such as, ilmenite, rutile and monazite in beach sands, along the coastal tracts of the country. Its concentration in the deposits is about 0.6–18.7% of the total heavy minerals. Indian zircons analyse 63–66% ZrO_2 . AMD has carried out reconnaissance investigation in parts of Gujarat, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Odisha and West Bengal during 2008-14. The resource estimation in these areas have been carried out up to March 2020. The resources of zircon are placed at 36.56 million tonnes as per Department of Atomic Energy (DAE). However, the Statewise break-up as on March 2020 is not available, so far the breakup of 33.71 million tonnes resources up to 2016 is furnished in Table-1.

EXPLORATION & DEVELOPMENT

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

PRODUCTION AND PRICES

Production of zircon increased to 15,600 tonnes in 2019-20 from 11,906 tonnes in the preceding year. The production of zircon is provided in Table-2. Prices of zircon as furnished by IREL and KMML are detailed in Table- 3.

**Table – 2: Production of Zircon
2017-18 to 2019-20**

(In tonnes)	
Year	Production of Zircon*
2017-18	9107
2018-19	11906
2019-20	15600

**As reported by Indian Rare Earths Ltd.*

**Table –3: Prices of Zircon,
2017-18 to 2019-20**

(₹ per tonne)			
Period	Grade	Price	Remarks
IREL			
2017-18	Q	70,215	-
	MK	-	-
	OR	61,638	-
2018-19	Q	1,05,245	-
	MK	1,03,099	-
	OR	90,149	-
2019-20	Q	1,06,790	-
	MK	1,07,032	-
	OR	95,297	-
KMML			
2017-18	Zircon Gr.I	85,167	Average
	Zircon Gr.II	80,167	Average
	Zircon Gr.III	76,167	Average
	Zircon Gr.IV	Nil	
2018-19	Zircon Gr.I	1,09,750	Average
	Zircon Gr.II	1,04,750	Average
	Zircon Gr.III	1,00,750	Average
	Zircon Gr.IV	98,500	Average
2019-20	Zircon Gr.I	1,15,000	Average
	Zircon Gr.II	1,10,000	Average
	Zircon Gr.III	1,06,000	Average
	Zircon Gr.IV	1,02,000	Average

Source: Department of Atomic Energy, Mumbai.

MINING AND PROCESSING

As per Gazette Notification No. S.O. 2685 dated 27.07.2019, grant of operating rights in any offshore in terms of any reconnaissance permit, exploration licence or production lease of atomic minerals as defined in Part B of the First Schedule of the Mines and Mineral (Development and Regulation Act, 1957 is prohibited to any person, except the Government or Government Company or a Corporation owned or controlled by the Government. The Indian Rare Earths Ltd (IREL), a Government of India Undertaking and Kerala Minerals and Metals Limited (KMML), a Kerala State Government Undertaking, are engaged actively in mining and processing of beach sands in India. Zircon is recovered by these companies as a co-product of mining/dredging of heavy mineral sands which include ilmenite, rutile, leucoxene, monazite, sillimanite and garnet. Beach sand deposits containing these minerals are obtained from coastal tracts of Manavalakurichi in Tamil Nadu, Chavara in Kerala and Gopalpur in Odisha. As such, no deposit is being worked exclusively for zircon alone. For details regarding mining and processing, etc., Review on 'Ilmenite and Rutile' may be referred. Plantwise capacity and production of zircon during 2017-18 to 2019-20 are given in Table -4.

Table – 4: Plantwise Capacity and Production of Zircon Ore, 2017-18 to 2019-20

(In tonnes)						
Company	Location	Specification	Installed capacity** (tpy)	Production		
				2017-18	2018-19	2019-20
Total			39000	13951	-	
Indian Rare Earths Ltd	Manavalakurichi, Kanniyakumari distt., Tamil Nadu	65% ZrO ₂ +HfO ₂ (min)	10000	*	2190	
	Chavara, Kollam distt., Kerala	65% ZrO ₂ +HfO ₂ (min.)	17500	2649	3072	11490
	Orissa Sand Complex, Ganjam distt., Odisha	64.25% ZrO ₂ (min)	5000	6458	6694	
Kerala Minerals & Metals Ltd	Chavara, Kollam distt., Kerala	Zircon Gr.I 64.0% (min.) Zircon Gr.II 62% (min.)	6500	4844	4762	4110

Source: Respective Producers and Department of Atomic Energy, Mumbai.

* During 2017-18 plant was not operating from Jan. 17 because of non-availability of environment clearance.

** Excluding the V.V.Mineral's installed capacity of 18000 tpy vide their letter and e-mail dated 09.09.2019 regarding non-operation of mining.

INDUSTRY

IREL has set up a dry grinding mill at Chavara, Kerala to produce Zirflour for its application in the Ceramic Industry. A wet grinding mill was also set up at Chavara to produce micro-zir for its specialised application as opacifier. Besides, IREL established a small chemical plant at Manavalakurichi, Tamil Nadu to produce zircon frit, zirconium chloride, etc., primarily for supply of zircon frit to Department of Atomic Energy's Nuclear Fuel Complex (NFC), Hyderabad. A pilot plant (3.5 tpy capacity) was set up at Orissa Sand Complex (OSCOM) to produce a whole range of zirconia stabilised with CaO, MgO and rare earths.

The NFC manufactures and supplies fuel bundles for Pressurised Heavy Water Reactors (PHWRs) and Boiling Water Reactors (BWRs) of NPCIL. Highest ever production of PHWR fuel bundles, Zirconium Oxide, Zirconium sponge and Niobium metal was achieved during the period. The NFC, Hyderabad, has different types of production facilities which include the zirconium oxide plant for processing of zircon to pure zirconium oxide and zirconium sponge plant for conversion of zirconium oxide to pure sponge metal and Zirconium Complex (ZC) at Pazhayakayal, near Thoothukudi, Tamil Nadu. NFC Hyderabad produced 585 tonnes, 470 tonnes and 605 tonnes of zirconium oxide during 2019-20 ,

2020-21 and 2021-22, respectively. ZC, Pazhayakayal, produced 454 tonnes, 408 tonnes and 535 tonnes of ZrO_2 in 2019-20, 2020-21 and 2021-22, respectively. Besides, the Zircaloy Fabrication Plant produces various zirconium alloy tubings and sheet, rod and wire products. The plant also has facilities for reclamation of zircaloy mill-scrap. Zircon sand is processed through caustic fusion, dissolution, solvent extraction (to remove hafnium), precipitation and calcination to obtain zirconium oxide. The pure oxide is then subjected to high temperature chlorination, reactive metal reduction and vacuum distillation to obtain homogeneous zirconium sponge. The sponge is briquetted with alloying ingredients and melted in vacuum to produce zircaloy ingots. The alloy ingots are extruded to convert into seamless tubes, sheets and bars. The total installed capacity and production of zirconium oxide and zirconium sponge plants at NFC and ZC are furnished in Table-5.

Besides, Bhalla Chemical Works Pvt. Ltd operates three plants—two of which are located in Gurgaon, Haryana to manufacture zirconium derivatives (ZrO_2), based on imported zircon ore (capacity 10,000 tpy) and zirconium silicate opacifiers (capacity 5,000 tpy). The third plant of the Company in Rajasthan manufactures zirconium oxychloride crystals and special zirconias (capacity 10,000 tpy).

Table –5 : Production of Zirconium Oxide and Sponge Plants of DAE at NFC and ZC, 2019-20 to 2021-22

(In tonnes)

Plant/Location	Installed capacity (tpy)	Production		
		2019-20	2020-21	2021-22
Zirconium Oxide Plant, NFC, Hyderabad	600	585	470	605
Zirconium Sponge Plant, NFC, Hyderabad	400	-	-	-
Zirconium Oxide Plant, ZC, Pazhayakayal	500	454	408	535
Zirconium Sponge Plant, ZC, Pazhayakayal	250	-	-	-

Source: Department of Atomic Energy, Mumbai.

USES & CONSUMPTION

Zircon's exceptional qualities of hardness and durability make it a must-use for the manufacture of ceramics and refractory tiles and also for a range of other high-tech applications, such as, armour plating on military aircraft, heat shield in space shuttles, potentially as solid oxide fuel cells in hydrogen- powered vehicles and in many industrial & chemical applications. Owing to its chemical inertness, very low heat conductivity, high specific gravity, low expansion, good resistance to abrasion, high melting point and no shrinkage on being heated up to 1,750^o C, zircon is found to be an outstanding refractory material. Zircon finds its application in ceramics, zirconia, chemicals, refractory and foundry & castings which accounts for zircon's total world estimated consumption. Zirconia and Zirconium chemicals can be used for a variety of uses. Yttria-stabilised zirconia (YSZ) is used in the manufacture of oxygen sensors that control combustion in automobile engines and furnaces. In Foundry Industry, zircon is used as facing for foundry moulds as it increases the resistance to metal penetration and accords a uniform finish to castings. Zircon sand is preferred to silica sand because of its uniform size, higher melting point, low thermal expansion and resistance to molten metal, acidic chemicals, slag, etc. Zircon containing 64% ZrO₂ is used generally for foundry applications. In Ceramic Industry, finely ground high-grade zircon and zirconium dioxide are used as opacifier in melts for vitreous enamelling and as pigment in ceramic glazes. Zirconium oxide is considered as a potential ceramic material for high temperature applications like engine components. Usually, zircon containing 65% ZrO₂ is preferred in ceramics. The toughened zirconia finds its use in ceramic coatings in jet aircraft engines and in other applications where strength and high temperature oxidation resistance are important. Zirconia ceramics are also used in automobile sensors for the microprocessor control of engines. In Chemical Industry, its property of high resistance to corrosion is used where dry chlorine, hydrochloric acid and caustic alkalies are involved. Abrasive and grinding wheels made from zircon sands are used for polishing optical

glasses. Zircon powder is used as a medium in waterjet cutting machines.

Zirconium and zirconium powders are used in ammunition, primers, detonation caps, flashlight mixtures, radio tubes and in various heating elements. Hafnium-free zirconium metal is used as cladding material in atomic reactors due to its low absorbing cross section for thermal neutron. Green, blue, indigo, red, orange coloured zircon is used as a natural gemstone and also processed to produce cubic zirconia — a synthetic gemstone resembling diamond. Zircon compounds have a very low toxicity and are not perceived as a potential environmental hazard. They are even said to have some medicinal properties and are now increasingly preferred in the manufacture of food products and pharmaceuticals too. It is also widely used in television and computer screens, resistance to corrosion and erosion makes zircon products ideal for use in the Chemical Industry and in desalination plants. Zircon flour is manufactured by milling zircon sand. It is used in ceramic frits, foundry mould coatings, ceramic shells for investment casting, refractories, friction products, insulating fibres and glass. Zircon opacifier are used in refractories and friction products. Zirconium metal or sponge is used mainly in the Nuclear Industry with a requirement for minimum content of hafnium.

Consumption of zircon/zirflour decreased considerably by 17% to 13,829 tonnes in 2019-20 from 16,600 tonnes in 2018-19. The consumption of zircon during the year 2019-20 was reported only by IREL. Consumption of zircon/zirflour during the year 2017-18 to 2019-20 is furnished in Table- 6.

**Table –6: Estimated Consumption * of Zircon
2017-18 to 2019-20
(By Industries)**

Industry	(In tonnes)		
	2017-18	2018-19 (R)	2019-20 (P)
All Industries	17500	16600	13829[#]
Ceramic	7200	6300	3963
Refractory	9700	9400	1153
Others (Alloy steel, iron & steel, Chemical, foundry, paint and cement)	600	900	8751

Figures rounded off.

** Includes actual reported consumption and/or estimates made wherever required. Due to paucity of data, coverage may not be complete.*

only reported by IREL.

RESEARCH & DEVELOPMENT

Various R&D studies have been conducted by R&D Laboratory, OSCOM, Department of Atomic Energy, to improve the metallurgical performance of mining and mineral separation plants. As a result throughput of the plants has increased and the grade and recovery of heavy minerals in concentrate has been enhanced. The two most outstanding contributions of this laboratory in the areas of value addition are development of new process flow sheets for the preparation of synthetic rutile from OSCOM ilmenite and zirconia from zircon.

IREL Technology Development Council (IRELTDC) has been formed with an objective of promoting industrial scale R & D that would be beneficial to the overall programme of DAE in both strategic and non-strategic fields utilizing mineral & value added products of IREL.

POLICY

Zircon was earlier classified as a 'prescribed substance', as per notifications issued under Atomic Energy Act, 1962. From the revised list notified vide S. O. No. 61(E), dated 20.1.2006, zircon has been deleted, subject to the condition that the mineral shall remain a prescribed substance till the policy on exploration of beach sand minerals notified on 6.10.1998, is adopted/revised/modified by Ministry of Mines or till 1.1.2007, whichever occurs earlier and shall cease to be so thereafter. Ministry of Mines, vide Notification No.S.O.2356(E) dated 11.07.2016, zircon covered under beach sand minerals was inserted as entry 12 after entry 11 of Part B of the First Schedule to the MMDR Act, 1957. As per the

Foreign Trade Policy, 2015-20, the export and import of zirconium ores and concentrates under ITC (HS) Code 26151000 are freely allowed. The notification reads:

S.O. 1592(E)—In pursuance of Clauses (f) and (g) of Sub-section (1) of Section 2 and Section 3 of the Atomic Energy Act, 1962 (No. 33 of 1962) and in supersession of the notifications of the Government of India in the Department of Atomic Energy vide Number S.O. 61(E) dated 20th January 2006, the Central Government hereby notifies the substances, equipment and technology specified in the Schedule appended hereto as 'Prescribed Substances, Prescribed Equipment and Technology'.

Under Category 0A303 and under Heading Nuclear materials, nuclear-related other materials, equipment and technology—"Zirconium with hafnium content of less than 1 part to 500 parts of zirconium by weight (i.e. less than 2,000 ppm) in the form of metal, alloys containing more than 50% zirconium by weight, compounds, manufactures thereof, waste or scrap of any of the foregoing".

G.S.R. 134(E) dated 20.02.2019— In exercise of the powers conferred under Section 11B of the Mines and Minerals (Development and Regulation) Act, 1957 (67 of 1957) and Rule 36 of the Atomic Minerals Concession Rules, 2016, the Central Government hereby makes the following amendments further to amend the Atomic Minerals Concession Rules, 2016, namely—

2. (1) These rules may be called the Atomic Minerals Concession (Second Amendment) Rules, 2019.

(2) They shall come into force on the date of their publication in the Official Gazette.

3. In the Atomic Minerals Concession Rules, 2016, for Schedule A, the following Schedule shall be substituted, namely—

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[See Rule 2 (1) (m) and Rule 36]

10.	Uranium bearing tailings left over from ores after extraction of copper and gold, ilmenite and other titanium ores.	60 ppm U ₃ O ₈ and/or 250 ppm ThO ₂ .
11.	Zirconium bearing minerals and ores including zircon.	All cases of zirconium-bearing minerals occurring in Beach Sand Minerals and other placer deposits in association with monazite are notified as above threshold (i.e. the threshold is 0.00% monazite in Total Heavy Minerals), irrespective of monazite grade. In other cases, zircon containing less than 2,000 ppm of Hafnium.
12.	Beach Sand Minerals, i.e., economic heavy minerals found in the teri or beach sand, which include ilmenite, rutile, leucoxene, garnet, monazite, zircon and sillimanite.	All cases of Beach Sand Minerals and other placer deposits in association with monazite are notified as above threshold (i.e., the threshold is 0.00% monazite in Total Heavy Minerals), irrespective of monazite grade.

WORLD REVIEW

World reserves of zirconium are placed at 68 million tonnes in terms of ZrO₂. The world's largest reserves are with Australia (71%), South Africa (9%) and Senegal (4%). The world production of zirconium minerals was estimated at 1.12 million tonnes in 2021 which decreased by 7% as against 1.20 million tonnes in the previous year. Australia (40%), South Africa (24%), Mozambique (9%) are the principal producers of zirconium minerals (Tables-7 & 8).

**Table – 7: World Reserves of Zirconium
(By Principal Countries)**

(In '000 tonnes of ZrO ₂)	
Country	Reserves
World: Total (rounded off)	68,000
Australia	48,000
China	500
Indonesia	NA
Mozambique	1,800
Senegal	2600
South Africa	5,900
USA	500
Other countries	8,500

*Source: USGS, Mineral Commodity Summaries, 2023
For Australia, Joint Ore Reserves Committee-compliant reserves were 22.1 million tonnes.

**Table – 8 : World Production of
Zirconium Minerals
(By Principal Countries)**

(In tonnes)			
Country	2019	2020	2021
World: Total (rounded off)	1372000	1205000	1125000
Australia	499335	434339	448022
South Africa*	370000	320000	270000
Mozambique	87181	78138	100158
Senegal	58432	59000	64000
Indonesia ^{(d)*}	73000	64000	58000
China*	33500	33500	50000
Kenya	48356	32224	25928
Ukraine	22000	22000	22000
Madagascar	28500	25300	22000
USA	100000	90000	20000
Other countries	73666	68676	45018

Source: BGS, World Mineral Production, 2017-21.

*Note: *) Estimate*

(i) Years ended 30 June of that stated.

(d) Conservative BGS estimates, based on exports.

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

Australia

Iluka produced 328,000 tonnes of zircon from its operations in Australia, an increase of 12% from that in 2017. The majority of the Cataby project in Western Australia was constructed in 2018 and was expected to begin production in the first half of 2019. With a projected mine life of 8.5 years, zircon production was anticipated to average about 50,000 metric tonnes per year. Iluka completed the feasibility study for moving mining from the Jacinth deposit to the adjacent Ambrosia deposit and the decision was made to proceed with the move sooner than originally planned. By the end of 2018, work was initiated on the Ambrosia deposit.

Tronox Holdings plc produced 34,000 tonnes of zircon from its Cooljarloo Mine in Western Australia, unchanged from that in 2017.

Sheffield Resources Ltd. obtained offtake agreements to account for almost all zircon and zircon concentrate production during the first 4-year phase of its Thunderbird project. Production of zircon in the first year of production was expected to be about 80,000 tonnes, increasing to 110,000 tonnes in the fourth year of production. Contingent on financing, Sheffield was expecting to commence production at Thunderbird in 2020.

China

As the leading consumer of zirconium mineral concentrates, China imported 1.05 million tonnes in 2018, an increase of 3% from 1.02 million tonnes imported in the previous year.

Kenya

Base Resources Ltd. produced 38,600 tonnes of zircon from its Kwale operation in the reporting year ending June 30, 2018, a decrease of 13% from that in the previous year. During the year, the Kwale Phase 2 mine project was ongoing. This work involved shutting down the mine and wet concentrator plant for the month of March to complete equipment installation and start a second hydraulic unit.

Madagascar

Base Resources acquired an 85% interest in the Toliara project in January and worked throughout the year to develop a labour plan and training programs in consultation with the Government and local communities. A prefeasibility study was expected to be completed in the first quarter of 2019, and the company projected production would begin in late 2021.

Mozambique

Kenmare Resources plc produced 74,700 tonnes of primary and secondary zircon at the Moma Mine in 2018. Increased production resulted from projects to increase recovery rates and capacity enhancement of the zircon recovery circuits. The company announced plans to expand capacity to increase ilmenite coproduct production by 20% by 2021.

Senegal

In July, Eramet Group acquired full ownership of the Grande Côte mineral sands operation operated by TiZir Ltd. Eramet reported zircon sales of 65,000 tonnes.

South Africa

Tronox produced 119,000 tonnes of zircon from its Namakwa Sands operation and 53,000 tonnes of zircon from its KZNSands operation in South Africa, for a total of 172,000 tonnes, an increase of 3% from that in 2017.

In 2018, Mineral Commodities Ltd. produced 17,000 tonnes of zircon-rutile concentrate, containing 68% zircon and 17% rutile, at its Tormin Mine in Western Cape Province. Although the amount of ore processed was greater than that in 2017, the zircon and rutile ore grades decreased from those in 2017.

Tanzania

Strandline Resources Ltd. continued to wait for mining licenses and seek funding for its Fungoni heavy-mineral-sands project. According to a definitive feasibility study completed in 2017,

ore reserves were 12.3 million tonnes containing 3.9% heavy minerals.

FOREIGN TRADE

Exports

Exports of zirconium ores and concentrates decreased to less than one tonne in 2021-22 from one tonne in the previous year. Exports were mostly to Austria and meagre quantity to China. Exports of zirconium and scrap was increased to 3 tonnes in 2021-22 as compared to previous year. Exports of zirconium waste & scraps was also increased to 2 tonnes in the year 2021-22 as compared to the year 2020-21 (Tables-9 to 12).

Imports

Imports of zirconium ores and concentrates increased by 38% to 94,839 tonnes in 2021-22 from 6,8675 tonnes in the Previous year. Main suppliers were Australia (50%), Malaysia (18%), South Africa (16%) and Indonesia (5%). Imports of zirconium and scrap drastically increased by 93% to 45 tonnes in 2021-22 as against 3 tonnes in 2020-21. Imports were mainly from Canada (40%), France (19%) & China (13%). Similarly imports of zirconium waste & scrap also increased substantially by 93% to 42 tonnes in 2021-22 as compared to 3 tonnes in the preceding year. Imports were mainly from from Canada (48%), China (15%) & Germany (10%) (Tables-13 to 17).

Table –9: Exports of Zirconium Ores & Conc. (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	++	21	++	180
Austria	++	16	–	–
Tanzania Rep	–	–	++	180
Venezuela	++	1	–	–
Latvia	++	++	–	–
China P Rp	++	4	–	–

Figures rounded off

**Table – 10: Exports of Zirconium & Scrap
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	++	24791	3	25189
USA	++	13170	++	3434
Iraq	++	3963	1	5424
Nigeria	—	—	++	2972
Australia	++	1994	++	2626
U Arab Emts	++	984	++	777
Peru	++	45	++	2384
Taiwan	++	707	++	2134
Vietnam Soc Rep	-	-	++	1823
Japan	-	-	++	1622
Canada	++	78	++	674
Other countries	++	3852	2	1319

*Figures rounded off***Table – 11: Exports of Zirconium Waste & Scrap
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	++	14644	2	13258
USA	++	9601	++	1031
Sweden	++	2330	++	47
Australia	++	1994	++	2626
Nigeria	-	-	++	2972
Taiwan	-	-	++	2020
Japan	-	-	++	1622
Ghana	-	-	++	300
UK	-	-	++	134
Peru	++	45	++	2384
Bangladesh Pr	-	-	2	93
Other countries	++	674	++	29

*Figures rounded off***Table – 12: Exports of Zirconium Unwrought Powder
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	++	10147	1	11931
Iraq	++	3963	1	5424
USA	++	3569	++	2403
Vietnam Soc Rep	—	—	++	1823
UAE	++	757	++	770
Taiwan	++	707	++	114
France	-	-	++	420
Canada	++	78	++	674
Denmark	-	-	++	114
Greece	-	-	++	63
Singapore	-	-	++	53
Other countries	++	1073	++	44

Figures rounded off

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**Table- 13: Imports of Zirconium Ores & Conc.
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	68675	6993378	94839	11260337
Australia	24963	2547148	48157	5605301
Indonesia	13076	1351599	3293	544617
South Africa	10530	1035297	16885	1797571
Malaysia	7253	757539	16177	2029298
USA	6179	632461	2853	331378
Senegal	2235	226470	979	132217
Vietnam Soc Rep	1338	132319	1172	174328
Sri Lanka Dsr	1282	124796	1130	136381
Ukraine	830	87831	364	38347
Thailand	234	20691	3477	424799
Other countries	755	77227	352	46100

*Figures rounded off***Table – 14: Imports of Zirconium & Scrap
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	3	23298	45	170561
China P Rp	1	8723	32	21363
USA	1	5964	1	7780
Italy	++	3914	++	6054
Germany	1	1978	1	16898
Malaysia	++	1439	2	5836
Japan	++	710	1	4177
UK	–	–	1	6600
Hong Kong	++	67	++	883
France	++	24	6	31782
Canada	–	–	1	68030
Other countries	++	479	++	1158

*Figures rounded off***Table – 15: Imports of Zirconium Unwrought Powders
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	++	115	3	28924
USA	++	100	–	–
Ukraine	++	15	–	–
France	–	–	3	26306
Germany	–	–	++	1957
UK	–	–	++	15
Korea Rp	–	–	++	563
Hong Kong	–	–	++	83

Figures rounded off

**Table – 16: Imports of Zirconium Waste & Scrap
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	3	23183	42	141637
China P Rp	1	8723	32	21363
USA	1	5864	1	7780
Italy	++	3914	++	6054
Germany	1	1978	1	14941
Malaysia	++	1439	2	5836
Japan	++	710	1	4177
UK	-	-	1	6585
Hong Kon	++	67	++	800
France	++	24	3	5476
Canada	-	-	1	68030
Other countries	++	464	++	595

Figures rounded off

**Table – 17: Imports of Ferro- Zirconium
(By Countries)**

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	374	51237	522	96181
China P Rp	346	46248	512	92825
Hong Kong	15	3395	-	-
U Arab Emts	8	1371	2	334
UK	5	223	-	-
Netherland	-	-	8	3022

Figures rounded off

FUTURE OUTLOOK

The development of digital printing of ceramic tile pattern has the potential to increase demand since higher zircon content of the base tile is required to impart aesthetically appealing product and to optimise the cost of the digital printing process.

As per the Zircon Market updated 2023 of Zircomet Limited, the global demand for zircon sand has been estimated at 1.2 million tonnes for both 2021 and 2022. This is a 20% increase over 2019 and 2020. The demand has been driven by India, China and Europe.

Current demand remains firm in China, particularly in the ceramics industry as they move out of covid restrictions and the construction industry picks up. It is expected supply will remain quite tight during 2023 and further mine development is needed to meet future demand. As zircon sand is the starting raw material for the majority of zirconium chemicals and zirconium oxides, prices of these materials are expected to remain firm with upward pressure during 2023.

Zircon and Zirflor are the key ingredients in ceramics, foundry and refraction and are likely to see growth path on account of Government of India's thrust for 'Housing for all'.