

GARNET



# Indian Minerals Yearbook 2021

(Part- III : MINERAL REVIEWS)

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GARNET

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MINISTRY OF MINES  
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# 13 Garnet

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**G**arnet is the collective name for a group of minerals which crystallise in cubic system with different chemical composition. The principal members of the Garnet group are Almandine (Fe-Al), Pyrope (Mg-Al), Spessartine (Mn-Al), Grossularite (Ca-Al), Andradite (Ca-Fe) and Uvarovite (Ca-Cr). Almandine is hardest amongst all varieties and is often used for abrasive purpose. Garnet is dense & hard with sharp angular chisel-edged fracture, containing small amounts of free silica and exhibits high resistance to physical and chemical attacks. It is used both as semi-precious stone and as an abrasive. The hardness of garnet varies from 6.5 to 7.5 on Mohs scale. This allows it to be used as an effective abrasive.

## RESERVES / RESOURCES

In India, garnet deposits suitable for use in Abrasive Industry occur in Andhra Pradesh, Chhattisgarh, Jharkhand, Kerala, Odisha, Rajasthan, Tamil Nadu and Telangana. Gem variety of garnet occurs in Ajmer, Bhilwara, Jhunjhunu, Sikar and Tonk districts, Rajasthan; Nellore and Srikakulam districts, Andhra Pradesh; Khammam district, Telangana and Coimbatore, Ramanathapuram, Tirunelveli, Kanyakumari, Tiruchirappalli and Tiruvarur districts, Tamil Nadu. Garnet is found to occur in beach sands along with ilmenite, rutile, sillimanite, etc. in the States of Kerala, Odisha and Tamil Nadu.

The total reserves/resources of garnet in India as on 1.4.2020, as per UNFC system has been placed at 56.01 million tonnes of which Reserves under Proved and Probable categories together constituted 8.60 million tonnes. Of the total resources, about 20.87 million tonnes are of Abrasive grade, whereas resources of Semi-

precious grade are mere 8,468 tonnes. Tamil Nadu alone accounted for about 46% of the total resources followed by Andhra Pradesh (31%), Odisha (17%) and Telangana (3%). The remaining States together shared less than 3% (Table- 1).

## EXPLORATION & DEVELOPMENT

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

## PRODUCTION AND STOCKS

### Garnet (Abrasive)

Production of garnet (abrasive) is at 9,307 tonnes during 2020-21 compared to 568 tonnes in the preceding year. Similarly, there were only 6 reporting mines during 2020-21 as against 7 mines reported in the year 2019-20. Only four principal producer accounted for about 100 % of the total production during the year.

Unlike previous year the share of Public Sector in the total output was about nil in 2020-21 as same in the previous year. Similarly, the share of Private Sector in the total output was cent per cent in 2020-21 as same in the preceding year.

In 2020-21, unlike that of previous year, production was reported only from the State of Rajasthan, i.e., three principal producers from Rajasthan accounted for about cent per cent of the total output during the current year (Tables-2 to 4).

Mine-head closing stocks of garnet (abrasive) for the year 2020-21 were 3,832 tonnes as against 45,947 tonnes in the previous year (Table -5). The average daily employment of labour during 2020-21 was 51 as against 39 in the previous year.

**Table – 1 : Reserves/Resources of Garnet as on 1.4.2020 (P)**  
(By Grades/States)

(Unit: tonnes)

Grade/State	Reserves			Remaining Resources					Total Resources (A+B)				
	Proved STD111	Probable STD121 STD122	Total (A)	Feasibility STD211	Pre-feasibility STD221 STD222	Measured STD331	Indicated STD332	Inferred STD333		Reconnaissance STD334	Total (B)		
<b>All India : Total</b>	<b>8539521</b>	<b>50946</b>	<b>8590472</b>	<b>1835546</b>	<b>1624128</b>	<b>4622014</b>	<b>138905</b>	<b>10226601</b>	<b>28066885</b>	<b>902574</b>	<b>47416654</b>	<b>56007126</b>	
<b>By Grades</b>													
Gem	-	-	1	5847	16279	23919	0	0	110	4	46158	46160	
Abrasive	8486371	50920	4	8537296	1705715	1526269	4568321	102866	15602	3514907	902570	12336249	20873545
Semi-precious	612	26	-	637	2093	132	1630	39	1249	2688	-	7831	8468
Others	-	-	-	-	9051	36358	-	-	-	215573	-	260982	260982
Unclassified	52538	-	-	52538	85485	43806	394	36000	10208995	23951287	-	34325967	34378505
Not-known	-	-	-	-	27355	1284	27750	-	756	382321	-	439466	439466
<b>By States</b>													
Andhra Pradesh	-	-	-	-	1196087	237025	1359988	18	8800000	5674011	-	17267129	17267129
Chhattisgarh	-	-	-	-	-	-	-	-	-	28800	-	28800	28800
Jharkhand	-	-	-	-	-	-	88303	-	-	21768	-	110071	110071
Kerala	-	-	-	-	-	-	45797	100874	-	52190	-	198861	198861
Odisha	8330045	-	1	8330046	5	-	1	-	-	348001	-	1177318	9507364
Rajasthan	156938	50946	4	207888	310712	191094	33115	2013	17606	215120	73263	842923	1050811
Tamil Nadu	52538	-	-	52538	266555	1153976	3094811	36000	1408995	19871019	-	25831356	25883894
Telangana	-	-	-	-	62187	42033	-	-	-	1855976	-	1960196	1960196

Figures rounded off

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**Table – 2 : Principal Producers of Garnet (Abrasive), 2020-21**

Name & address of producer	Location of mine	
	State	District
AKD Gem Garnet Mines, F-203, Near Mahapragya Circle, Azad Nagar, Bhilwara - 311 001, Rajasthan.	Rajasthan	Bhilwara
Arun Bagdiya,C/o,Shri Ramdev Bagdiya,Resi No-110,Kendriya Vihar, Sector-8,Bidyadhar Nagar, Jaipur-302039, Rajasthan.	Rajasthan	Ajmer
Ummad Singh Ranawat, Vill-Basda,P.O.Gundali Bhilwara-311001 Rajasthan.	Rajasthan	Bhilwara

*\*Producing as an associated mineral with sillimanite.*

**Table – 3 : Production of Garnet (Abrasive) 2018-19 to 2020-21  
(By States)**

(Qty in tonnes; Value in ₹'000)

State	2018-19		2019-20		2020-21 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>123404</b>	<b>1746756</b>	<b>568</b>	<b>1775</b>	<b>9307</b>	<b>33585</b>
Andhra Pradesh	72521	1068152	-	-	-	-
Odisha	38376	545745	-	-	-	-
Rajasthan	5166	23662	568	1775	9307	33585
Tamil Nadu	7341	109197	-	-	-	-

**Table – 4 : Production of Garnet (Abrasive), 2019-20 & 2020-21  
(By Sectors/States/Districts)**

(Qty in tonnes; Value in ₹'000)

State/District	2019-20			2020-21 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>7</b>	<b>568</b>	<b>1775</b>	<b>6</b>	<b>9307</b>	<b>33585</b>
Public sector	-	-	-	-	-	-
Private sector	7	568	1775	6	9307	33585
<b>Rajasthan</b>	<b>5</b>	<b>568</b>	<b>1775</b>	<b>4</b>	<b>9307</b>	<b>33585</b>
Ajmer	2	-	-	1	4560	15062
Bhilwara	2	553	1670	2	4741	18494
Tonk	1	15	105	1	6	29
<b>Tamil Nadu</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>-</b>	<b>-</b>
Tiruchirapalli	2	-	-	2	-	-

*Note-The main reason for decrease in number of mines is classification of some Garnet producing mines, such as BSM mines in Andhra Pradesh, Odisha and Tamil Nadu. Earlier, these mines were considered under Garnet (Abrasive) as a part of MCDR mineral as there was no separate classification of Beach Sand Minerals (BSM) and Non-Beach Sand Minerals (Non-BSM).*

**Table – 5 : Mine-head Closing Stocks of Garnet (Abrasive) 2019-20 & 2020-21 (By States)**

State	(In tonnes)	
	2019-20	2020-21 (P)
<b>India</b>	<b>45947</b>	<b>3832</b>
Andhra Pradesh	326	326
Odisha	-	-
Rajasthan	3424	2864
Tamil Nadu	42197	642

### Garnet (Gem)

No production of garnet (gem) was reported since 2018-19.

## USES & CONSUMPTION

The most important industrial use of garnet in the form of garnet sand is as an abrasive. About 90% production of abrasive garnet is used for manufacturing of garnet-coated papers, clothes and discs. Garnet-coated abrasives are used in the form of belts, covers for drums, discs or as small sheets. It is used for cleaning spark plugs, paints, polishing and grinding of plate-glass. The remaining 10% output is used in the form of loose grains for surfacing and polishing soft stones (marble, slate, soapstone, etc.). Clear, flawless and rich-coloured crystals of garnet are used as semi-precious stones. The principal variety among them are pyrope, deep-crimson almandine, orange-yellow grossularite, etc. Other uses are in Electronic and Television Industry for polishing glass and TV tubes. Garnet granules are used in 'abrasive blasting' commonly called 'sand blasting' in order to smoothen, clean and remove oxidation products from metals, stone and other material. MMTC's specifications of garnet sand used for sand blasting/jet cutting/other uses for exports to USA, Europe, Middle East and Taiwan are as follows: Al<sub>2</sub>O<sub>3</sub>: 20.8 to 21.2%, Bulk density; 2.17 kg/m<sup>3</sup>, Hardness in Mohs scale should be 7.5 to 8.

Water jet cutting machines generally use finely-ground 80-120 mesh size garnet as cutting medium with high pressure water. Owing to its inertness to a wide range of chemicals and relatively high specific gravity, it is used as filter medium for water and other liquids.

## SUBSTITUTES

Other natural and manufactured abrasives can substitute to some extent for all major end uses of garnet. In many cases, however, using the substitutes would entail sacrifices in quality or cost. Fused aluminum oxide and staurolite compete with garnet as a sandblasting material. Ilmenite, magnetite and plastics compete as filtration media. Corundum, diamond and fused aluminum oxide compete for lens grinding and for many lapping operations. Emery is a substitute in nonskid surfaces. Fused aluminum oxide, quartz sand and silicon carbide compete for the finishing of plastics, wood furniture and other products.

## WORLD REVIEW

Garnet group of minerals are found throughout the world in metamorphic, igneous and sedimentary rocks.

World resources of garnet are large and occur in a wide variety of rocks, particularly, gneisses and schists. Garnet also occurs in contact-metamorphic deposits in crystalline limestones, pegmatites, serpentinites and in vein deposits. In addition, alluvial garnet is present in many heavy-mineral sand and gravel deposits throughout the world. Large domestic resources of garnet also are concentrated in coarsely-crystalline gneiss near North Creek, NY; other significant domestic resources of garnet occur in Idaho, Maine, Montana, New Hampshire, North Carolina, and Oregon. In addition to those in the United States, major garnet deposits exist in Australia, Canada, China, India and South Africa, where they are mined for foreign and domestic markets; deposits in Russia and Turkey also have been mined in recent years, primarily for internal markets. Additional garnet resources are in Chile, Czechia, Pakistan, Spain, Thailand and Ukraine; small mining operations have been reported in most of these countries.

In 2021, Australia produced about 33% of total global production of garnet (Industrial), followed by China (28%), South Africa (13%), India (12%), USA (7%) and the remaining 5 % was contributed by other countries. Russia and Turkey are also mining garnet for domestic markets. Garnet is also mined in Canada, Chile, Czech Republic, Pakistan, South Africa, Spain, Thailand and Ukraine.

Worldwide the end uses of garnet and market shares are: abrasive blasting media 30%, abrasive grains for water jet cutting 35%, water filtration 20%, abrasive powder 10% and other end uses 5 per cent.

The world reserves/resources and production of industrial garnet are furnished in Tables- 6 and 7.

**Table – 6 : World Reserves of Garnet (Industrial)  
(By Principal Countries)**

(In 000' tonnes)	
Country	Reserves
<b>World: Total (rounded)</b>	<b>Moderate to Large</b>
Australia	Moderate to large
China	Moderate to large
India*	13000
South Africa	NA
USA	5000
Other countries	6500

*Source: USGS Mineral Commodity Summaries, 2022*

\* In India as per NMI data based on UNFC system the total reserves/resources of garnet as on 1.4.2020 are estimated at 56.01 million tonnes.

**Table – 7 : World Production of Garnet (Industrial)  
(By Principal Countries)**

(In tonnes)			
Country	2019	2020	2021
<b>World: Total (rounded)</b>	<b>1120000</b>	<b>1100000</b>	<b>1100000</b>
Australia	352000	360000	360000
China	310000	310000	310000
South Africa	179000	140000	140000
India*	120000	130000	130000
USA	104000	101000	75000
Other countries	60000	60000	60000

*Source: USGS, Mineral Commodity Summaries 2022,*

*Note : Figures are rounded off*

\* India's production of garnet (abrasive) during 2018-19, 2019-20 and 2020-21 was at 123 thousand tonnes, 568 tonnes and 9,307 tonnes, respectively.

## FOREIGN TRADE

### Exports

In 2020-21, exports of abrasive garnet increased drastically by 3% to 76,799 tonnes from 74,697 tonnes in the previous year. Exports were mainly to USA (26%), UAE (12%), Malaysia & Saudi Arabia (9% each) and Italy (7%). Exports in terms of value in respect of cut & uncut garnet variety decreased drastically by 23% to 28.08 crore in 2020-21 from 36.69 crore in the previous year. In terms of value, exports were mainly to Thailand (28%), Hong Kong (25%), USA (17%), Japan (5%) and UAE (4%).

Out of the total exports in terms of value of cut & uncut garnet in 2020-21, cut variety of garnet accounted for 93 % share and the remaining 7 % was contributed by the uncut garnet. In terms of value Exports of cut variety were mainly to Thailand (29%), Hong Kong (21%), USA (18%), Japan (5%) & UK (7%). Similarly, exports of uncut garnet were mainly to Hong Kong (68%), Thailand (21%), China (6%) USA (3%) and the remaining 2% share was contributed by the other countries (Tables- 8 to 11).

### Imports

In 2020-21, imports of abrasive garnet decreased marginally by 12 % to 345 tonnes from 391 tonnes in the previous year. Imports were from UK (70%), UAE (30%). Imports in terms of value in respect of cut & uncut garnet variety decreased drastically by 47% to 9.73 crore in 2020-21 from 18.45 crore in the previous year. In terms of value, imports were mainly from Thailand (25%), Hong Kong (23%), USA (12%), Kenya (11%), Sri Lanka (10%), Tanzania (7%) & Czech Republic (5%).

Out of the total imports in terms of value of cut & uncut garnet in 2020-21, uncut variety of garnet accounted for 67% share and the remaining 33% was contributed by the cut garnet. In terms of quantity, imports of uncut variety were mainly from Mozambique (55%) and Thailand, Hong Kong, Tanzania, Zambia & Nigeria (9% each). Similarly, imports of cut garnet were mainly from Hong Kong (47%), Sri Lanka (43%), Thailand (7%) and USA (2%) (Tables-12 to 15).

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**Table-8 : Exports of Garnet (Abrasive)  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>74697</b>	<b>1254539</b>	<b>76799</b>	<b>1265586</b>
USA	42965	712791	19989	308885
UAE	8344	155561	9184	157482
Saudi Arabia	3696	67251	6540	116809
Malaysia	5692	84781	7057	113156
Italy	2100	34965	5208	91648
Canada	2718	43360	3325	57665
Kuwait	2156	36960	3472	53941
Qatar	448	8262	2986	52016
Oman	1232	23534	2688	46263
Egypt	280	4597	2352	38622
Other countries	5066	82477	13998	229099

Figures rounded off

**Table-9 : Exports of Garnet (Cut & Uncut)  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (**)	Value (₹'000)	Qty (**)	Value (₹'000)
<b>All Countries</b>	<b>**</b>	<b>366806</b>	<b>**</b>	<b>280824</b>
Thailand	**	116128	**	79120
Hong Kong	**	114741	**	69715
USA	**	63982	**	47384
UK	**	8603	**	18439
Japan	**	15624	**	13710
UAE	**	9008	**	10032
Armenia	**	5450	**	7682
Germany	**	6215	**	6396
Sri Lanka	**	1551	**	4267
Italy	**	7580	**	4082
Other countries	**	17924	**	19997

Note : \*\* - Not additive. The total may not tally.  
Figures rounded off

**Table-10 : Exports of Garnet (Cut)  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty ('000crt)	Value (₹'000)	Qty ('000crt)	Value (₹'000)
<b>All Countries</b>	<b>42177</b>	<b>333070</b>	<b>76049</b>	<b>260630</b>
Thailand	4095	112291	1473	74972
Hong Kong	2236	90241	1502	55990
USA	11499	60578	2398	46737
UK	473	8340	1647	18157
Japan	291	15624	350	13673
UAE	224	9008	173	10032
Armenia	113	5450	109	7682
Germany	693	5447	277	6396
Sri Lanka	1	1551	++	4263
Italy	170	7580	104	4082
Other countries	22382	16960	68016	18646

Figures rounded off

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**Table – 11 : Exports of Garnet (Uncut)  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty	Value	Qty	Value
	(t)	(₹'000)	(t)	(₹'000)
<b>All Countries</b>	<b>134</b>	<b>33736</b>	<b>111</b>	<b>20194</b>
Hong Kong	134	24500	84	13725
Thailand	++	3837	++	4148
China	++	37	27	1240
USA	++	3404	++	647
UK	++	263	++	282
Australia	-	-	++	57
France	++	160	++	49
Japan	-	-	++	37
Sri Lanka	-	-	++	4
Taiwan	-	-	++	4
Other countries	++	1535	++	1

*Figures rounded off***Table – 12 : Imports of Garnet (Abrasives)  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty	Value	Qty	Value
	(t)	(₹'000)	(t)	(₹'000)
<b>All Countries</b>	<b>391</b>	<b>6189</b>	<b>345</b>	<b>14712</b>
UK	-	-	241	12734
UAE	391	6130	104	1978
New Zealand	++	59	-	-

*Figures rounded off***Table- 13: Imports of Garnet (Cut & Uncut)  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty	Value	Qty	Value
	(**)	(₹'000)	(**)	(₹'000)
<b>All Countries</b>	<b>**</b>	<b>184466</b>	<b>**</b>	<b>97335</b>
Thailand	**	52000	**	24582
Hong Kong	**	26025	**	22559
USA	**	12869	**	11447
Kenya	**	37664	**	10668
Sri Lanka	**	12119	**	9393
Tanzania	**	7138	**	6826
Czech Republic	**	342	**	4639
UK	**	50	**	1406
Zambia	**	406	**	1351
Nigeria	**	1114	**	1330
Other countries	**	34739	**	3134

*Note : \*\* - Not additive. The total may not tally.**Figures rounded off*



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**Table – 14 : Imports of Garnet (Cut)  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (‘000 crt)	Value (₹‘000)	Qty (‘000 crt)	Value (₹‘000)
<b>All Countries</b>	<b>4969</b>	<b>55401</b>	<b>1437</b>	<b>32565</b>
Sri Lanka	1313	12119	622	9393
Thailand	761	15419	105	7548
Hong Kong	2024	14278	669	6260
Tanzania	-	-	7	3053
USA	539	11273	22	2809
UK	++	18	4	1406
Germany	13	83	1	512
France	-	-	1	73
Canada	3	206	++	36
Vietnam	-	-	++	31
Other countries	316	2005	6	1444

*Figures rounded off***Table – 15 : Imports of Garnet (Uncut)  
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹‘000)	Qty (t)	Value (₹‘000)
<b>All Countries</b>	<b>56</b>	<b>129065</b>	<b>11</b>	<b>64770</b>
Thailand	3	36581	1	17034
Hong Kong	8	11747	1	16299
Kenya	1	37664	++	10668
USA	++	1596	++	8638
Czech Republic	++	342	++	4623
Tanzania	7	7138	1	3773
Zambia	++	406	1	1351
Nigeria	++	1114	1	1330
Mozambique	11	7610	6	716
Madagascar	25	4698	++	165
Other countries	1	20169	++	173

*Figures rounded off*

## **FUTURE OUTLOOK**

Garnet has a wide range of applications, such as, in production of abrasives, sand blasting, water filtration materials, abrasive blasting media and water-jet cutting. Garnet is expected to continue replacing silica sand blasting media, owing to latter's associated occupational health risks. Moreover, garnet is safer for the environment and cheaper to dispose of after recycling. Hence, the worldwide demand for garnet is expected to increase, especially

for waterjet cutting and for abrasive blasting media. China and India are expected to steadily increase garnet production and will become significant garnet sources for other countries. The garnet market is very competitive. To increase profitability and remain competitive with imported material, production may be restricted to only high-grade garnet ores as a by-product of other saleable mineral products that occur with garnet, such as, kyanite, marble, metallic ores, mica minerals, sillimanite, staurolite or wollastonite.

