

CORUNDUM AND SAPPHIRE



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CORUNDUM AND SAPPHIRE

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Corundum is the crystalline form of aluminium oxide (Al_2O_3) with traces of iron, titanium and chromium. It is a rock forming mineral. It is one of the naturally clear transparent materials, but can have different colors when impurities are present. Transparent specimens are used as gems, called ruby if red and padparadscha pink-orange. All other colors are called sapphire, e.g., "green sapphire" for a green specimen.

Because of corundum's hardness (pure corundum is defined to have 9.0 Mohs), it can scratch almost every other mineral. It is commonly used as an abrasive, on everything from sandpaper to large machines used in machining metals, plastics and wood. Some emery is a mixture of corundum and other substances and it is less abrasive, with an average hardness near 8.0.

In addition to its hardness corundum is unusual for its density of 4.02 g/cm^3 , which is very high for a transparent mineral composed of the low atomic mass elements aluminium and oxygen.

RESOURCES

Corundum occurs as a mineral in mica schist, gneiss and some marbles in metamorphic terrain. It also occurs in low silica igneous syenite and nepheline syenite intrusives. Other occurrences are as masses adjacent to ultramafic intrusives, associated with lamprophyre dikes and as large crystals in pegmatites. It commonly occurs as a detrital mineral in stream and beach sands because of its hardness and resistance to weathering.

In India, it is found in association with kyanite and sillimanite in Assam, Meghalaya and Maharashtra. It occurs in syenites and ultrabasic rocks in Andhra Pradesh. A few outcrops of pegmatites containing corundum occur in Bastar district, Chhattisgarh and Morena district, Madhya Pradesh.

Precious and semi-precious varieties of corundum have been reported from Tamil Nadu in Kangeyam belt stretching over Karur and Kulithalai tehsils in Tiruchirapalli district and Vedachandur tehsil in Dindigul district.

As per UNFC System as on 1.4.2010 (provisional), the total resources of corundum were estimated at 740,792 tonnes of which 598 tonnes were placed under reserves category and bulk, i.e., 740,194 tonnes under 'remaining resources' category. The resources of corundum are located in Karnataka (87%), Andhra Pradesh (10%) and Rajasthan (2%), besides Tamil Nadu and Chhattisgarh. The total resources of industrial grade and semi-precious grade were 710,323 tonnes and 909 tonnes, respectively.

The total resources of ruby were estimated at 5,348 kg of which 236 kg were placed under reserves category and the balance 5,112 kg under 'remaining resources' category. The entire resources are in Odisha. The total resources of sapphire were estimated at 450 kg, all placed under 'remaining resources' category in Jammu & Kashmir (Table - 1).

PRODUCTION, STOCKS AND PRICES

Corundum

No production of corundum was reported during the year 2011-12.

Mine-head stocks at the end of the year were 490 kg as against 3490 kg at the beginning of the year (Table - 4).

Ruby

There was no production of ruby in 2010 - 11 as also in 2011-12 due to temporary closure of the sole public sector mine in Odisha.

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**Table – 1 : Reserves/Resources of Corundum as on 1.4.2010
(By Grades/States)**

(In '000 tonnes)

Grade / State	Reserves				Remaining resources					Total resources (A+B)			
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332		Inferred STD333	Reconnaissance STD334	Total (B)
		STD121	STD122			STD221	STD222						
All India : Total	-	310	288	598	5824	763	115167	13	38	92388	526000	740194	740792
By Grades													
Semi-Precious Industrial	-	1	-	1	-	12	-	-	1	895	-	908	909
Others	-	309	288	597	-	751	105874	-	28	77073	526000	709726	710323
Unclassified	-	-	-	-	-	-	11	13	1	2533	-	2558	2558
Not known	-	-	-	-	5824	-	9282	-	8	11883	-	26997	26997
By States													
Andhra Pradesh	-	-	-	-	5824	7	9282	-	-	62007	-	77120	77120
Chhattisgarh	-	310	288	598	-	-	-	-	-	288	-	288	886
Karnataka	-	-	-	-	-	756	105885	13	38	14169	526000	646861	646861
Rajasthan	-	-	-	-	-	-	-	-	-	11925	-	11925	11925
Tamil Nadu	-	-	-	-	-	-	-	-	-	4000	-	4000	-
All India : Total	143	-	93	236	-	-	3165	286	38	1623	-	5112	5348
By Grades													
Unclassified	143	-	93	236	-	-	3165	286	38	1623	-	5112	5348
By States													
Odisha	143	-	93	236	-	-	3165	286	38	1623	-	5112	5348
SAPPHIRE (In kg)													
All India : Total	-	-	-	-	-	-	-	-	-	450	-	450	450
By Grades													
Unclassified	-	-	-	-	-	-	-	-	-	450	-	450	450
By States													
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	450	-	450	450

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Table – 2 : Principal Producers of Corundum, 2011-12

Name & address of producer	Location of mine	
	State	District
*Maharashtra State Mining Corporation Ltd Plot No.7, Ajni Square, Wardha Road, Nagpur - 440 015, Maharashtra.	Maharashtra	Bhandara

*Associated with sillimanite.

Table – 3 : Production of Corundum, 2009-10 to 2011-12 (By States)

(Qty in kg; value in ₹ '000)

State	2009-10		2010-11		2011-12	
	Quantity	Value	Quantity	Value	Quantity	Value
India	6600	20	-	-	-	-
Maharashtra*	6600	20	-	-	-	-

* Associated with sillimanite.

Table – 4 : Mine-head Stocks of Corundum, 2011-12 (P) (By States)

(In kg)

State	At the beginning of the year	At the end of the year
India	3490	490
Maharashtra*	3490	490

* Associated with sillimanite.

CONSUMPTION

Corundum is used in abrasives, such as grinding wheels, papers and clothes, mortar and wire drawing and grinding powder. It is used in special refractories because of its high melting point.

The total reported consumption of corundum in organised sector in 2011-12 was 240 tonnes of which, 100 tonnes was in refractory, 140 tonnes in abrasive industries (Table -5).

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Table – 5 : Reported Consumption of Corundum 2009-10 to 2011-12 (By Industries)

Industry	(In tonnes)		
	2009-10	2010-11	2011-12
All Industries	170	240	240
Abrasive	70 (1)	140 (1)	140(1)
Refractory	100 (1)	100 (1)	100 (1)

Figures rounded off.

Data collected on non-statutory basis.

Figures in parentheses denote the number of units in organised sector reporting consumption.*

(Includes actual reported consumption and/or estimates made wherever required.)*

WORLD REVIEW

Corundum for abrasives is mined in Zimbabwe, Russia, Sri Lanka and India. Historically, it was mined from deposits associated with dunites in North Carolina, USA and from a nepheline syenite in Craigmont, Ontario, Emery grade corundum is found on the Greek island of Naxos and near Peekskill, New York, USA. Abrasive corundum is synthetically manufactured from bauxite.

FOREIGN TRADE

Exports of corundum (natural) was nil in 2011-12 as compared to 412 tonnes to Qatar in 2010-11. Exports value of uncut ruby and sapphire decreased to ₹ 124 lakh in 2011-12 from ₹ 461 lakh in the previous year. Exports were mainly to Hong Kong (Tables - 6 & 7).

Imports of corundum (natural) were nil in 2010-11 and 2011-12. Imports of ruby and sapphire (uncut) increased to 17 tonnes valued at ₹ 9,233 lakh in 2011-12 from 16 tonnes valued at ₹ 3,713 lakh in the previous year. Imports were mainly from Thailand and Hong Kong (Table - 8).

Table – 6 : Exports of Corundum (Natural) (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	412	2527	-	-
Qatar	412	2527	-	-

Table – 7 : Exports of Ruby and Sapphire : Uncut (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1	46074	1	12416
Thailand	++	570	++	7202
Hong Kong	++	667	1	4599
Brazil	--	--	++	600
USA	++	166	++	9
Switzerland	1	42661	++	5
Other countries	++	2010	++	1

Table – 8 : Imports of Ruby and Sapphire : Uncut (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	16	371299	17	923279
Thailand	7	183386	7	431898
Hong Kong	1	45724	5	356750
U Arab Emts.	++	1285	++	21321
UK	++	1258	++	19863
Germany	++	4498	++	19633
Guinea	1	14826	3	14872
Tanzania Rep.	2	39061	++	12723
China	++	915	++	11222
Zambia	++	8214	++	9762
Brazil	++	22388	++	5147
Other countries	5	49744	2	20088