

27 Corundum and Sapphire

Corundum is the crystalline form of aluminium oxide. Its hardness is next to diamond and for this reason, it is used mainly in manufacturing abrasive material and also as precious stone. In sintered form, it is used in special refractory crucibles. As far as natural corundum's production is concerned it is too less to meet the demand all over the world and therefore, synthetic corundum is used widely.

Transparent gem varieties of corundum are known as Ruby and Sapphire. The principal properties of pleasing and uniform colour, ability to take high polish, amenability to cutting and shaping without developing secondary flaws like cracks, etc. and durability make the varieties of corundum gem to near gemstones. Gem corundum other than red is generally called sapphire. Ruby is rose-red, carmine or purple, which is often called pigeon's blood-red. True sapphire is blue, the best stone being a velvety cornflower blue called "Kashmir blue". Other colours of sapphire include white, yellow or green, violet and pink.

RESOURCES

Corundum is found in metamorphosed shales and some unsaturated igneous rocks. 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. Occurrences of sapphire are reported from Katamalkailakat-Baberi-Amera, Bhujipadar and Ghumur-Sargigunda belts in Kalahandi district, Orissa. Ruby is reported from Jillingdhar in Kalahandi district, Orissa. Besides, occurrences are also reported from Bangalore, Chickmagalur, Hassan, Mysore, Shimoga and Tumkur districts in Karnataka. In Mysore area, bright red ruby crystals were reported to be embedded in a thin layer of white surrounding rock.

Precious and semi-precious varieties of corundum have also 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 1.4.2005, the total resources of corundum were estimated at 83,795 tonnes of which 605 tonnes were placed under reserves category and bulk, i.e., 83,190 tonnes under 'remaining resources' category. The total resources of corundum are located in Andhra Pradesh (61%), Karnataka (19%) and Rajasthan (14%), besides Tamil Nadu and Chhattisgarh. The total resources of industrial grade and semi-precious grade were 79,352 tonnes and 909 tonnes, respectively.

The total resources of ruby were estimated at 5,271 kg of which 1,925 kg were placed under reserves category and the balance 3,346 kg under 'remaining resources' category in Orissa. 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

Production of corundum at 84,500 kg during 2007-08 registered a decrease of 46% as compared to the previous year. In the current year, the entire production of corundum was reported from only one mine in Karnataka and two mines associated with kyanite & sillimanite located in Maharashtra. Share of public sector mines was 75% and the remaining production was from private sector (Tables - 2 to 4).

Mine-head stocks at the beginning of the year were 150,420 kg as against 18,450 kg at the end of the year (Table-5).

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The average daily employment of labour in 2007-08 was 15 as against nil in the previous year. Domestic prices of corundum are furnished in Table-6.

Ruby

There was no production of ruby in 2007-08 as also in the previous year due to temporary closure of the sole public sector mine in Orissa.

**Table – 1 : Reserves/Resources of Corundum, Ruby and Sapphire as on 1.4.2005
(By Grades/States)**

Grade/State	Reserves			Remaining resources					Total resources (A+B)	
	Proved STD111	Probable STD122	Total (A)	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333		Total (B)
				STD221	STD222					
CORUNDUM (In tonnes)										
All India : Total	317	288	605	756	915	13	49	81457	83190	83795
By Grades										
Semi-precious	8	-	8	5	-	-	1	895	901	909
Industrial	309	288	597	751	904	-	27	77073	78755	79352
Others	-	-	-	-	-	-	-	4	4	4
Unclassified	-	-	-	-	11	13	13	2521	2558	2558
Not known	-	-	-	-	-	-	8	963	971	971
By States										
Andhra Pradesh	7	-	7	-	-	-	-	51088	51088	51095
Chhattisgarh	310	288	598	-	-	-	-	288	288	886
Karnataka	-	-	-	756	915	13	49	14157	15890	15890
Rajasthan	-	-	-	-	-	-	-	11925	11925	11925
Tamil Nadu	-	-	-	-	-	-	-	4000	4000	4000
RUBY (in kg)										
All India : Total	143	1782	1925	-	1683	-	-	1663	3346	5271
Orissa										
SAPPHIRE (in kg)										
All India : Total	-	-	-	-	-	-	-	450	450	450
Jammu & Kashmir										

Figures rounded off.

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Table - 2 : Producers of Corundum, 2007-08

Name & address of producer	Location of mine	
	State	District
*Maharashtra State Mining Corporation, Udyog Bhawan, Civil Lines, Nagpur-440 001.	Maharashtra	Bhandara
*Shri Pradeep Golcha Civil Lines, Nagpur.	Maharashtra	Bhandara
Shri Meer Bahadur Hussain 2nd Cross, Lendon Street, Bangalore, Karnataka.	Karnataka	Mysore

* Associated with kyanite & sillimanite.

**Table – 3 : Production of Corundum, 2005-06 to 2007-08
(By States)**

(Qty. in kg; value in Rs.'000)

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	58000	116	156000	378	84500	287
Karnataka	-	-	-	-	5800	67
Maharashtra*	58000	116	156000	378	78700	220

* Associated with kyanite and sillimanite

**Table – 4 : Production of Corundum, 2006-07 and 2007-08
(By States)**

(Qty. in kg; value in Rs.'000)

State	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	*(2)	156000	378	1*(2)	84500	287
Public sector	*(1)	66000	198	*(1)	63000	189
Private sector	*(1)	90000	180	1*(1)	21500	98
Karnataka/Mysore	-	-	-	1	5800	67
Maharashtra/Bhandara	*(2)	156000	378	*(2)	78700	220

* Figures in parentheses indicate number of associated mines with kyanite and sillimanite.

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**Table – 5 : Mine-head Stocks of Corundum, 2007-08 (p)
(By States)**

(In kg)

State	At the beginning of the year	At the end of the year
India	150420	18450
Karnataka	10000	-
Maharashtra *	140420	18450

* Associated with kyanite & Sillimanite.

**Table – 6 : Prices of Corundum, 2005-06 to 2007-08
(Domestic Markets)**

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08(p)
Corundum, +70% Al ₂ O ₃	Ex-mine Pohara (Maharashtra)	2500	2750-3479	3500
Corundum Reject	Ex-mine Pohara (Maharashtra)	650	720-911	915

MINING AND MARKETING

The only semi-mechanised mine reporting production of corundum was in Bhandara district, Maharashtra. The semi-precious varieties are recovered along with industrial grades in Bhopalpatnam in Bastar district in Chhattisgarh. After washing, stones are hand-picked and sorted out by visual observation, considering their ability to take polish. Semi-precious stones are sold to Ratnaparishkar Kendra (Khadigram Udyog Parishad) and to other craft centres at Jagdalpur, Chhattisgarh. The industrial variety is supplied to the local units and to the abrasive factory at Hanumana in Rewa district, Madhya Pradesh.

Cutting and polishing of indigenous and imported ruby and sapphire is carried out mainly in Jaipur, Rajasthan.

CONSUMPTION

Corundum is used in abrasives, such as grinding wheels, papers and clothes, mortar and wiredrawing 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 2007-08 was 210 tonnes of which, 100 tonnes was in refractory, 70 tonnes in abrasive, 30 tonnes in foundry and 10 tonnes in asbestos products industries (Table -7).

**Table - 7 : Reported Consumption of Corundum
2005-06 to 2007-08
(By Industries)**

(In tonnes)

Industry	2005-06	2006-07	2007-08(p)
All Industries	210	210	210
Abrasive	70 (1)	70(1)	70(1)
Asbestos products	10 (1)	10(1)	10(1)
Foundry	30 (1)	30(1)	30(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.

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WORLD REVIEW

Production of good quality rubies has been reported from Afghanistan, Myanmar and Madagascar. Most of the production was exported to Thailand for cutting. Vietnam continued to produce various ranges of rubies ranging from finest red of pinkish red rubies. Pakistan and Afghanistan produced a moderate quantity of finely-coloured rubies and pink sapphires. Thailand imported large number of stones from neighbouring countries like Myanmar, Vietnam, Cambodia as also from Madagascar, Somalia, Kenya and Tanzania. Australia produced small quantities of rubies from many areas.

Sapphires were extensively mined in Sri Lanka. Myanmar and Madagascar. Nigeria,

Australia, Thailand and China also produced sapphires.

FOREIGN TRADE

Exports of corundum (natural) increased to 332 tonnes in 2007-08 from 291 tonnes in the previous year. Indonesia, Saudi Arabia and Norway were the main buyers in 2007-08. Exports value of uncut ruby and sapphire decreased to Rs. 1.66 crore in 2007-08 from Rs. 3.28 crore in the previous year. Exports were mainly to Thailand. Imports of ruby and sapphire (Uncut) increased to 34 tonnes valued at Rs. 22.4 crore in 2007-08 from 10 tonnes valued at Rs. 29.4 crore in the previous year. Imports were mainly from Thailand and UAE (Tables 8 to 10).

**Table – 8 : Exports of Corundum (Natural)
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	291	2071	332	2773
Saudi Arabia	62	832	80	1021
Indonesia	-	-	168	926
Norway	-	-	56	441
Japan	-	-	23	266
USA	217	1129	5	119
Thailand	12	110	-	-

**Table – 9 : Exports of Ruby and Sapphire : Uncut
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	++	32777	++	16606
Thailand	++	2299	++	10923
Tanzania	++	412	++	2161
Hong Kong	++	26025	++	1762
Switzerland	-	-	++	637
USA	-	-	++	436
UAE	-	-	++	349
Belgium	++	213	-	-
Kenya	++	502	-	-
Madagascar	++	1956	-	-
Zambia	++	1370	-	-
Other countries	-	-	++	338

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**Table – 10 : Imports of Ruby and Sapphire : Uncut
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	10	293896	34	224343
Brazil	++	14409	++	12283
Hong Kong	1	11325	++	13006
Israel	++	14189	-	-
Kenya	1	7209	1	9422
Switzerland	++	6903	++	252
Tanzania	++	26487	2	18204
Thailand	5	121845	7	77800
UAE	2	44539	2	56020
USA	++	4428	++	5848
Zambia	1	31089	++	16062
Other countries	++	11473	22	15446