

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 a precious stone. In sintered form, it is used in special refractory crucibles. As far as natural corundum production is concerned it is too less to meet the demand all over the world and therefore, synthetic corundum is used widely.

Ruby and sapphire are the transparent gem varieties of corundum. 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, Odisha. Ruby is reported from Jillingdhar in Kalahandi district, Odisha. 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 1.4.2010 (provisional), the total resources of corundum were estimated at 109,821 tonnes of which 598 tonnes were placed under reserves category and bulk, i.e., 109,223 tonnes under 'remaining resources' category. The total resources of corundum are located in Andhra Pradesh (70%), Karnataka (14%) and Rajasthan (11%), besides Tamil Nadu and Chhattisgarh. The total resources of industrial grade and semi-precious grade were 79,353 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

The production of corundum at 6,600 kg during 2009-10 registered a decrease of 69% as compared to the previous year. In the current year, the entire production of corundum was reported from a single public sector mine in Maharashtra associated with sillimanite (Tables - 2 to 4).

Mine-head stocks at the end of the year were 23,050 kg as against 33,450 kg at the beginning of the year (Table - 5). The prices of corundum are furnished in the General Review on Prices.

Ruby

There was no production of ruby in 2009-10 as also in the previous year due to temporary closure of the sole public sector mine in Odisha.

CORUNDUM AND SAPPHIRE

Table - 1 : Reserves/Resources of Corundum, Ruby and Sapphire as on 1.4.2010 (P)
(By Grades/States)

State/Grade	Reserves				Remaining resources				Total resources (A+B)			
	Proved STD111	Probable		Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332		Inferred STD333		
		STD121	STD122		STD221	STD222					Total B	
All India : Total	19220596	4288467	14540774	38049836	57004	1008010	2800094	2235339	8381135	38250244	52731826	90781662
CORUNDUM (In tonnes)												
All India : Total		310	288	598	5824	763	10197	13	38	92388	109223	109821
By Grades												
Semi-precious	-	1	-	1	-	12	-	-	1	895	908	909
Industrial	-	309	288	597	-	751	904	-	28	77073	78756	79353
Others	-	-	-	-	-	-	-	-	-	4	4	4
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	915	13	38	14169	15891	15891
Rajasthan	-	-	-	-	-	-	-	-	-	11925	11925	11925
Tamil Nadu	-	-	-	-	-	-	-	-	-	4000	4000	4000
RUBY (In kg)												
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 State												
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 State												
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	450	450	450

Figures rounded off.

CORUNDUM AND SAPPHIRE

Table – 2 : Principal Producers of Corundum, 2009-10

Name & address of producer	Location of mine	
	State	District
*Maharashtra State Mining Corporation, Udyog Bhawan, Civil Lines, Nagpur - 440 001. Maharashtra	Maharashtra	Bhandara

* Associated with sillimanite.

**Table – 3 : Production of Corundum, 2007-08 to 2009-10
(By States)**

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

State	2007-08		2008-09		2009-10 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	89920	322	21000	63	6600	20
Karnataka	10800	130	-	-	-	-
Maharashtra*	79120	192	21000	63	6600	20

* Associated with sillimanite.

**Table – 4 : Production of Corundum, 2008-09 and 2009-10
(By State)**

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

State	2008-09			2009-10 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	1	21000	63	(1)	6600	20
Public sector	-	-	-	(1)	6600	20
Private sector	(1)	21000	63	-	-	-
Maharashtra	(1)	21000	63	(1)	6600	20
Bhandara	(1)	21000	63	(1)	6600	20

* Figures in parentheses indicate number of associated mine with sillimanite.

CORUNDUM AND SAPPHIRE

**Table – 5 : Mine-head Stocks of Corundum
2009-10 (P)
(By State)**

State	(In kg)	
	At the beginning	At the end
India	33450	23050
Maharashtra*	33450	23050

* Associated with sillimanite.

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 2009-10 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 -6).

**Table – 6 : Reported Consumption of Corundum
2007-08 to 2009-10
(By Industries)**

Industry	(In tonnes)		
	2007-08	2008-09	2009-10 (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.*

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

WORLD REVIEW

Production of good quality rubies has been reported from Afghanistan, Myanmar and Madagascar. Most of the production is 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 imports 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 produce sapphires.

FOREIGN TRADE

Exports of corundum (natural) increased to 6,807 tonnes in 2009-10 from 2,312 tonnes in the previous year. Saudi Arabia, Qatar, Bahrain, were the main buyers in 2009-10. Exports value of uncut ruby and sapphire increased to Rs. 83.3 lakh in 2009-10 from Rs. 15 lakh in the previous year. Exports were mainly to UK, USA & Thailand (Tables -7 & 8).

CORUNDUM AND SAPPHIRE

Imports of corundum (natural) were nil in 2009-10 against negligible imports during the preceding year. Imports of ruby and sapphire (Uncut) decreased to 4 tonnes valued at Rs.31.33 crore in 2009-10 from 10 tonnes valued at Rs. 17.48 crore in the previous year. Imports were mainly from Hong kong, Honduras and Thailand (Tables - 9 & 10).

**Table – 7 : Exports of Corundum (Natural)
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	2312	9801	6807	34137
Saudi Arabia	824	3398	4229	21595
Qatar	–	–	1537	7487
Bahrain Is	784	3031	967	4707
Spain	–	–	24	175
Nepal	13	94	50	173
Japan	3	38	–	–
Kuwait	476	1540	–	–
Thailand	20	83	–	–
UAE	192	1615	–	–
Other countries	++	2	–	–

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

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	++	1468	++	8333
UK	–	–	++	6335
USA	–	–	++	1479
Thailand	++	674	++	508
Sweden	–	–	++	10
Germany	++	424	–	–
Hong Kong	++	130	–	–
Nigeria	++	72	–	–
Philippines	++	168	–	–
Other countries	–	–	++	1

CORUNDUM AND SAPPHIRE

**Table – 9 : Imports of Corundum (Natural)
(By Countries)**

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	++	54	–	–
Thailand	++	54	–	–

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

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	10	174802	4	313259
Hong Kong	++	37728	2	117165
Honduras	–	–	++	114343
Thailand	6	66262	1	51612
Tanzania	2	25378	++	8791
Kenya	1	12824	++	8652
Sri Lanka	++	75	++	3560
Guinea	++	10609	1	3438
Zambia	++	3881	++	1396
Malawi	1	1047	++	836
USA	++	11112	++	458
Other countries	++	5886	++	3008