

CORUNDUM AND SAPPHIRE



# Indian Minerals Yearbook 2014

(Part- III : Mineral Reviews)

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**CORUNDUM AND SAPPHIRE**

**(ADVANCE RELEASE)**

**GOVERNMENT OF INDIA  
MINISTRY OF MINES  
INDIAN BUREAU OF MINES**

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# 11 Corundum and Sapphire

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**C**orundum is a crystalline mineral that occurs in different colours, such as, white, grey, blue, green, red, yellow, or brown-based on impurities present. It is usually found in metamorphosed shales and limestones, in veins, and in some igneous rocks. It is used as an abrasive and as gemstone. As gems the red variety is called ruby and blue, sapphire. It is composed of aluminium oxide ( $Al_2O_3$ ). Its crystal structure is hexagonal (rhombohedral). The ruby and sapphire are mineralogically mere coloured crystals of corundum, whose mineral composition on chemical analysis is shown to consist of earth alumina in crystallised state nearly in pure condition. These gems have almost invariably been discovered in the beds of rivers.

In addition to its hardness of up to 9 on Mohs scale, corundum's density of  $4.02 \text{ g/cm}^3$  is unusually high for a transparent mineral composed of low atomic mass elements, such as, 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 dykes and as large crystals in pegmatites. It commonly occurs as a detrital mineral in streams 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. Translucent to opaque ruby, sometimes with asterism is known to be abundant at Mysuru and Subramaniam in Karnataka, India

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 was estimated at 741 thousand tonnes of which 598 tonnes were placed under Reserves category and the bulk of 740.19 thousand tonnes under 'Remaining Resources' category. The resources of corundum are located in Karnataka (87%), Andhra Pradesh (10%) and Rajasthan (2%), besides a share of the Remaining Resources was contributed by Tamil Nadu and Chhattisgarh. The total resources of Industrial grade and Semi-precious grade was 710 thousand tonnes and 909 tonnes, respectively.

The total resources of ruby was 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 is located in Odisha. The total resources of sapphire was estimated at 450 kg, all of which is placed under 'Remaining Resources' category and is located in Jammu & Kashmir (Table - 1).

## EXPLORATION AND DEVELOPMENT

No exploration was carried out during the year 2013-14 by any exploratory agency.

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

(In 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>310</b>	<b>288</b>	<b>5824</b>	<b>763</b>	<b>115167</b>	<b>13</b>	<b>38</b>	<b>92388</b>	<b>526000</b>	<b>740194</b>	<b>740792</b>
<b>By Grades</b>												
Semi-precious	-	1	-	-	12	-	-	1	895	-	908	909
Industrial	-	309	288	-	751	105874	-	28	77073	526000	709726	710323
Others	-	-	-	-	-	-	-	-	4	-	4	4
Unclassified	-	-	-	-	-	11	13	1	2533	-	2558	2558
Not known	-	-	-	5824	-	9282	-	8	11883	-	26997	26997
<b>By States</b>												
Andhra Pradesh	-	-	-	5824	7	9282	-	-	62007	-	77120	77120
Chhattisgarh	-	310	288	-	-	-	-	-	288	-	288	886
Karnataka	-	-	-	-	756	105885	13	38	14169	526000	646861	646861
Rajasthan	-	-	-	-	-	-	-	-	11925	-	11925	11925
Tamil Nadu	-	-	-	-	-	-	-	-	4000	-	4000	4000
<b>Ruby( in kg)</b>												
<b>All India : Total</b>	<b>143</b>	-	<b>93</b>	-	-	<b>3165</b>	<b>286</b>	<b>38</b>	<b>1623</b>	-	<b>5112</b>	<b>5348</b>
<b>By Grades</b>												
Unclassified	143	-	93	-	-	3165	286	38	1623	-	5112	5348
<b>By States</b>												
Odisha	143	-	93	-	-	3165	286	38	1623	-	5112	5348
<b>Sapphire (in kg)</b>												
<b>All India : Total</b>	-	-	-	-	-	-	-	-	<b>450</b>	-	<b>450</b>	<b>450</b>
<b>By Grades</b>												
Unclassified	-	-	-	-	-	-	-	-	450	-	450	450
<b>By States</b>												
Jammu & Kashmir	-	-	-	-	-	-	-	-	450	-	450	450

## CORUNDUM AND SAPPHIRE

**PRODUCTION, STOCKS  
AND PRICES**

No mine-head stock of corundum was reported at the beginning of the year and at the end of the year 2013-14.

**Corundum**

No production of corundum was reported during the year 2013-14. Production of 5 tonnes was reported during the previous year solely by Karnataka state (Tables - 2 & 3)

**Ruby**

There was no production of ruby in both the years, i.e., 2012-13 and 2013-14 .

**Table – 2 : Production of Corundum, 2011-12 to 2013-14(P)**  
(By States)

(Qty in kg; Value in ₹'000)

State	2011-12		2012-13		2013-14 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	37000	130	5000	75	-	-
Maharashtra*	37000	130	-	-	-	-
Karnataka	-	-	5000	75	-	-

\* Associated with Kyanite.

**Table – 3 : Production of Corundum, 2012-13 & 2013-14(P)**  
(By Sector/State Districts)

(Qty in kg; Value in ₹'000)

State	2012-13			2013-14 (P)		
	No. of Mines	Quantity	Value	No. of Mines	Quantity	Value
<b>India</b>	<b>2</b>	<b>5000</b>	<b>75</b>	-	-	-
Private Sector	2	5000	75	-	-	-
<b>Andhra Pradesh</b>	<b>1*</b>	-	-	-	-	-
Khammam	1*	-	-	-	-	-
<b>Karnataka</b>	<b>1</b>	<b>5000</b>	<b>75</b>	-	-	-
Mandya	1	5000	75	-	-	-

\* : only labour reported..

**CONSUMPTION**

Industrywise consumption of corundum is not available. However, it is presumed that entire quantity of corundum produced as well as imported in the country is consumed by different industries. The apparent consumption of corundum during 2011-12, 2012-13 and 2013-14 was about 37 tonnes, 5 tonnes and 2 tonnes, respectively.

**WORLD REVIEW**

The area of Mogok, Burma (Myanmar) is the source of some of the best gem-quality Ruby. Another significant Burmese deposit is Mong Hsu. Corundum & Sapphire are reported from Sri Lanka, especially from the area of Ratnapura, Bibile, and Rakwana, Ruby with a brownish tint comes from Thailand, in the Chantaburi District. Fine gem Ruby and Sapphire comes from Luc Yen,

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Yenbai Province, Vietnam; the Hunza Valley, Gilgit, Pakistan; and Jegdalek, Sorobi District, Afghanistan. Gem quality Sapphire is reported from Pailin, Cambodia. Africa has recently become a significant producer of Corundum, especially in Madagascar, where it is found in the Zazafotsy Quarry, Ambahatraso; and in Andranondambo, Amboasary District. Rubies are found in Longido, Kilimanjaro Region and Winza, in Arusha area, Tanzania. In the U.S., the Yogo Gulch near Helena and waterworn Sapphires stones are found in the Missouri River throughout its length.

### FOREIGN TRADE

There were no exports of Corundum (natural) in 2013-14. Exports value of uncut ruby and sapphire decreased substantially to ₹ 19 crore in 2013-14 from ₹ 24 crore in the previous year. Exports were to USA (86%) and Hong Kong (14%) (Table - 4).

Imports of Corundum (natural) were 2 tonnes in 2013-14 (Table-5). Imports value of uncut ruby and sapphire increased considerably to 66 tonnes valued at ₹ 243 crore in 2013-14 from 44 tonnes valued at ₹ 174 crore in the previous year. Imports were mainly from Tanzania (48%), Thailand (26%) and UAE, Zambia & Brazil (6 % each) (Table - 6).

**Table -5: Imports of Corundum(Natural)  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>++</b>	<b>27</b>	<b>2</b>	<b>96</b>
China	-	-	2	96
Other countries	++	27	-	-

**Table – 4: Exports of Ruby and Sapphire: Uncut  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>33</b>	<b>242250</b>	<b>7</b>	<b>194458</b>
UAE	33	102225	++	160508
Switzerland	-	-	++	10816
USA	++	1198	6	5558
Germany	++	1615	++	4388
Israel	-	-	++	4191
Thailand	++	3236	++	3925
Japan	-	-	++	2002
Hong Kong	++	1135	1	1453
Hungary	++	807	++	580
Malaysia	++	592	++	508
Other countries	++	131442	++	529

**Table – 6: Imports of Ruby and Sapphire: Uncut  
(By Countries)**

Country	2012-13		2013-14	
	Qty (t)	Value (₹ '000)	Qty (t)	Value (₹ '000)
<b>All Countries</b>	<b>44</b>	<b>1742367</b>	<b>66</b>	<b>2428497</b>
Hong Kong	12	286829	1	619982
UAE	++	208	4	472229
Zambia	++	11476	4	449820
Brazil	1	31162	4	351607
Thailand	13	1369788	17	342853
USA	++	1761	++	48334
Tanzania	6	11941	32	46257
Mozambique	1	2552	1	46199
South Africa	-	-	++	14816
Israel	-	-	++	10657
Other countries	11	26650	3	25743