

FLUORITE



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**FLUORITE**

**(ADVANCE RELEASE)**

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

Indira Bhavan, Civil Lines,  
NAGPUR – 440 001

PHONE/FAX NO. (0712) 2565471  
PBX : (0712) 2562649, 2560544, 2560648  
E-MAIL : [cme@ibm.gov.in](mailto:cme@ibm.gov.in)  
Website: [www.ibm.gov.in](http://www.ibm.gov.in)

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# 12 Fluorite

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Fluorite or fluorspar is the common name of the mineral having chemical composition calcium fluoride ( $\text{CaF}_2$ ). In Mohs' scale, fluorite hardness is 4 and its specific gravity is normally 3.175-3.184  $\text{g/cm}^3$  but can be higher if rich in rare earth elements. It is a mineral with veritable bouquet of brilliant colours from hallmark colour purple to blue, green, yellow, colourless, brown, pink, black and reddish orange. The rich purple colour is by far the most famous and popular colour. It is an important commercial source of fluorine. Fluorite plays a vital role in the manufacturing industry and major consuming industries are chemical, cement, iron & steel, electrode etc. It is also used to produce synthetic cryolite without which aluminium extraction is not possible.

Fluorite is commonly deposited by hydrothermal solution sourced from igneous intrusions. The mineralisation occurs as veins or replacement deposits either by the filling of cavities and fissures or by the replacement of the host rock, typically carbonates.

Mainly two grades of fluorite are involved in consumption and trade, namely, the acid grade (acidspar) containing more than 97%  $\text{CaF}_2$  and the sub-acid grade analysing 97% or less  $\text{CaF}_2$ . The sub-acid grade includes metallurgical (60 to 85%  $\text{CaF}_2$ ) and ceramic (85 to 95%  $\text{CaF}_2$ ) grades and is commonly known as metallurgical grade (metspar). Fluorite production in the country is meagre when compared with the world production. Production of fluorite in the country is reported from the state of Maharashtra in 2014-15 and 2015-16.

In addition to the natural fluorite production, synthetic fluorite is recovered as by-product during uranium processing, petroleum alkylation and stainless pickling. The by-product, fluorosilicic acid, obtained from phosphoric acid plants while processing phosphate rock also supplements fluorite as a source of fluorine.

## RESERVES/RESOURCES

As per NMI data base, based on the UNFC

system, the total reserves/resources of fluorite in the country as on 1.4.2015 have been estimated at 18.18 million tonnes. Out of these, 0.29 million tonnes are placed under reserves category (further classified into 0.22 million tonnes under proved category and 0.06 million tonnes under probable category). Remaining resources comprise 17.89 million tonnes.

By States, Gujarat accounts for 66% of the total reserves/resources having 12 million tonnes, followed by Rajasthan with 5.24 million tonnes (29%), Chhattisgarh 0.55 million tonnes (3%) and Maharashtra 0.39 million tonnes (2%). Gradewise, the resources are classified into marketable grade which accounted for 81% of the total resources, low grade (17%) and unclassified grade (2%) (Table-1).

## EXPLORATION & DEVELOPMENT

The exploration and development details are given in the review on EXPLORATION & DEVELOPMENT in "GENERAL REVIEWS".

## PRODUCTION & STOCKS

The production of fluorite (graded) at 1,175 tonnes in 2016-17 decreased by 50% as compared to that in the previous year. The single captive mine of GMDC is not in operation since October 2010.

There were two reporting mines in 2016-17 as well as in 2015-16. The entire output was reported from a public sector mine located in Chandrapur district of Maharashtra owned by Maharashtra State Mining Corporation Ltd (Tables - 2 to 4).

The mine-head closing stock of fluorite (graded) was 97,793 tonnes in 2016-17 as against 96,619 tonnes in 2015-16 (Table-5).

The average daily labour employed in fluorite mines in 2016-17 was 45 as against 58 in the previous year. The domestic price of fluorite are furnished in the General Review on 'Prices'.

**Table – 1 : Reserves/Resources of Fluorite as on 1.4.2015  
(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>224824</b>	<b>63860</b>	<b>-</b>	<b>288684</b>	<b>4976749</b>	<b>745390</b>	<b>571311</b>	<b>1713833</b>	<b>6218421</b>	<b>3522537</b>	<b>145183</b>	<b>17893423</b>	<b>18182107</b>
<b>By Grades</b>													
Marketable	224824	63860	-	288684	4976749	586080	406111	-	5757010	2497534	145183	14368666	14657350
Low	-	-	-	-	-	3790	9680	1710348	445660	1000003	-	3169481	3169481
Unclassified	-	-	-	-	-	155520	155520	3485	15751	25000	-	355276	355276
<b>By States</b>													
Chhattisgarh	-	-	-	-	65889	153132	9288	185485	5573	126088	-	545455	545455
Gujarat	-	-	-	-	4279230	-	-	-	5723360	2001920	-	12004510	12004510
Maharashtra	224824	63860	-	288684	-	-	-	-	-	100000	-	100000	388684
Rajasthan	-	-	-	-	631630	592258	562023	1528348	489488	1294529	145183	5243458	5243458

*Figures rounded off.*

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**Table – 2 : Producer of Fluorite, 2016-17**

Name and 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	Chandrapur

**Table – 3 : Production of Fluorite (Graded), 2014-15 to 2016-17  
(By States)**

(Qty in tonnes; Value in ₹'000)

State	2014-15		2015-16		2016-17(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India/</b>	<b>2946</b>	<b>13761</b>	<b>2333</b>	<b>12965</b>	<b>1175</b>	<b>6166</b>
Maharashtra	2946	13761	2333	12965	1175	6166

**Table – 4 : Production of Fluorite (Graded), 2015-16 & 2016-17  
(By Sector/States/Districts)**

(Qty in tonnes; Value in ₹'000)

State/District	2015-16			2016-17 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>2</b>	<b>2333</b>	<b>12965</b>	<b>2</b>	<b>1175</b>	<b>6166</b>
Public Sector	2	2333	12965	2	1175	6166
<b>Gujarat</b>	<b>1*</b>	-	-	<b>1*</b>	-	-
Vadodara	1	-	-	1	-	-
<b>Maharashtra</b>	<b>1</b>	<b>2333</b>	<b>12965</b>	<b>1</b>	<b>1175</b>	<b>6166</b>
Chandrapur	1	2333	12965	1	1175	6166

(p): Provisional

\*: Only labour reported.

**Table – 5 : Mine-head closing Stocks of Fluorite, 2015-16 & 2016-17  
(By States)**

(In tonnes)

State	2014-15	2015-16 (P)
<b>India</b>	<b>94296</b>	<b>96619</b>
Gujarat	84382	84372
Maharashtra	9914	12247

## FLUORITE

### MINING

Maharashtra State Mining Corporation (MSMC) operates Dongargaon fluorite mines in District Chandrapur, Maharashtra. Mining is carried out by semi-mechanised opencast method. The run-of-mine is hand sorted for marketing of fluorite (graded).

### BENEFICIATION

Fluorspar is beneficiated by hand sorting followed by gravity concentration methods such as heavy media, jigs and tables in order to separate calcite and silicate mineral impurities. Low grade fluorite produced is used after beneficiation in the industries. GMDC has a beneficiation plant of 500 tpd capacity located at Kadipani to produce acid grade (96% CaF<sub>2</sub>) and metallurgical grade (90% CaF<sub>2</sub>) fluorite upgrading the low grade fluorspar ore from 23-25% CaF<sub>2</sub> by flotation method. Besides, it has facility to produce MFC & MET grade powder analysing 75 to 85% CaF<sub>2</sub> & 85 to 92.5% CaF<sub>2</sub> respectively, starch briquettes (81% CaF<sub>2</sub> min) and silicate briquettes (79% CaF<sub>2</sub> min). As per annual report of GMDC 2016-17, the Government of Gujarat has accorded approval for setting up beneficiation plant of 40,000 MTPA capacity at Kadipani, district Vadodara in joint venture with Gujarat Fluoro Chemicals Ltd, Noida and Navin Fluorine International, Mumbai. Selection of suitable technology is completed and further necessary action will be taken. Valuation report for Kadipani assets has been received from Ernst and Young. Based on report, land will be eased on hire basis to JV Company and asset transfer will be carried out in favour of JV Company. GMDC conducted a pilot study for Fluorspar Beneficiation Plant of ore through BGRIMM China and the ore has been found suitable for producing Acid Fluorspar. EPC contract will be finalised soon.

Dongargaon mine of MSMC is semi-mechanised open-cast mine, the ore is beneficiated in a beneficiation plant of SANBRO Corporation Ltd, situated at Waregaon, Koradi, Nagpur district, to produce fluorite concentrate.

### CONSUMPTION

Fluorite consumption was 4,000 tonnes in 2016-17. The major consuming industry is

**Table- 6: Estimated Consumption\* of Fluorite  
2014-15 to 2016-17  
(By Industries)**

Industry	2014-15	2015-16 (R)	2016-17 (P)
<b>All Industries</b>	<b>63100</b>	<b>63500</b>	<b>4000</b>
Alloy steel	1400	1500	400
Cement	4100	4100	-
Chemical	53300	53400	-
Electrode	2100	2000	1500
Ferro-alloys	200	200	-
Iron & steel	1700	2000	2000
Others (aluminium, foundry glass, Refractories)	300	300	100

*Figures rounded off.*

*\*Includes actual reported consumption and/or estimates made, wherever required and due to paucity of data, hence coverage may not be complete. Apparent consumption of fluorite is around 1,84,870 tonnes during 2016-17.*

the Iron & Steel industry which accounted for more than 50% of the total consumption. Industrywise consumption of fluorite is given in Table-6.

### SPECIFICATIONS

BIS has prescribed IS: 8587-1993 (First Revision, reaffirmed 2011) for acid grade fluorite for use in chemical industries, and IS: 4574-1989 (Second Revision, reaffirmed 2008) for fluorite in metallurgical industries.

### USES

Acid grade fluorite is used as a feedstock in the manufacture of hydrofluoric acid (HF) and to produce aluminium fluoride (AlF<sub>3</sub>). The major use of HF is for the production of a wide range of fluorocarbon chemicals, including hydrofluorocarbons (HFCs), hydrochlorofluorocarbons (HCFCs), and fluoropolymers. But, owing to environmental concerns, part of chlorofluorocarbons (CFCs) are replaced by HCFCs. HF is used in the manufacture of uranium tetrafluoride required to make nuclear fuel and fission explosives. It is also used in stainless pickling, petroleum alkylation, glass etching, oil & gas well treatment and as etcher/cleaner in electronic industry.

## FLUORITE

HF is used in the manufacture of a host of fluorine chemicals used in dielectrics, metallurgy, wood preservatives, herbicides, mouthwashes, decay-preventing dentifrices, plastics and water fluoridation.

$AlF_3$  manufactured from acid grade fluorite is used as a flux in electrolytic recovery of aluminium. On an average, worldwide consumption of fluorides is about 21 kg for every tonne of aluminium produced. This ranged from 10 to 12 kg per tonne in a modern pre-baked aluminium smelter and about 40 kg in an old Soderberg smelter without scrubber.

Ceramic grade fluorite containing 85 to 95%  $CaF_2$  is used in ceramic industry as a flux and as an opacifier in the production of flat glass, white or opal glass and enamels. The addition of 10-30% ceramic grade fluorspar to glass makes it opaque, white and opalescent. It is also used in the manufacture of magnesium. Some manganese chemicals and welding rod coating.

Metallurgical grade fluorite is used primarily as fluxing agent by steel industry. It is added to slag to make it more reactive through increased fluidity. Fluorite of different grades is used in the manufacture of aluminium, cement and glass fibres. It is also used in the melt shop by foundry industry.

## INDUSTRY

Many fluorine-based chemicals like hydrofluoric acid, aluminium fluoride, cryolite, sodium silicofluoride and hydrofluorosilicic acid were produced by chemical and fertilizer industries in the country.

In addition to material produced indigenously, substantial quantity of high grade fluorite was also imported to meet the demand of the fluorine-based chemical industries.

The Tanfac Industries Ltd is a joint sector company of TIDCO and Aditya Birla Group at Cuddalore, Tamil Nadu. It is engaged in the

manufacture of fluorine chemicals, such as, aluminium fluoride, anhydrous hydrofluoric acid, sodium silico fluoride, ammonium bifluoride, potassium fluoride, and various other fluorine-based chemicals. The company has an annual installed capacity of 16,500 tonnes each of aluminium fluoride and anhydrous hydrogen fluoride, 67,200 tonnes of sulphuric acid, 14,000 tonnes of hydrofluoric acid and 3,400 tonnes of speciality fluorides. The Company's topline had gone up by 9% in year 2015-16 due to increased sales volume of Aluminium Fluoride and Sulphuric Acid. Revival of IBAP plant by successfully reducing the cost of production through process optimisations and successfully developing and marketing value added products out of By-products generated from the IBAP process.

Navin Fluorine Industries Ltd, Surat, Gujarat, has an installed capacity of about 22,000 tpy of hydrofluoric acid. The Company produces a number of fluorine chemicals, namely, hydrofluoric acid, cryolite, aluminium fluoride and various other organic and inorganic fluorine-based chemicals.

Apatite and rock phosphate containing 3 to 4%  $CaF_2$  was another useful source for recovery of fluorine. Coimbatore Pioneer Fertilizer Ltd has reported production of sodium silicofluoride in the past. Hydrofluorosilicic acid producing units were Rashtriya Chemicals & Fertilizer Ltd, Mumbai, whereas Dharamsi Morarji Chemical Co. Ltd, Ambernath, Maharashtra no longer report production of fluorine chemicals. Aluminium fluoride was being produced by Southern Petrochemical Industries Corporation Ltd, Thoothukudi, Tamil Nadu with an installed capacity of 2,560 tpy.

## SUBSTITUTES

Olivine or dolomitic limestone was used as substitute for fluorite in Iron & Steel industry. The by-product fluorosilicic acid from phosphoric acid production was used as a substitute in aluminium fluoride production.

## ENVIRONMENT

Fluorine attracts environmental concern. Use of fluorine in drinking water has begun to wane. Fluorine is toxic in high concentration but beneficial in low concentration. Although fluorine has been under attack ever since its use in water in 1949, the only significant health problem with which it has been linked was 'Fluorosis', a disease that involves health defects and bone lesions. This problem is caused by concentration of fluoride that is much higher than the permissible levels in municipal water supplies. As per Indian Standards, the permissible limit of fluoride in the drinking water is 1.5 mg/l. "Defluoridisation by adsorption" is a common economical and efficient method for removal of excess fluoride from drinking water. Electrolytic precipitation based on use of aluminium salts and by electrochemical route, etc. are the other few methods used for defluoridisation.

Fluorine is at the centre of controversy over chlorofluorocarbons (CFCs), which causes depletion of atmospheric ozone layer that protects the earth from ultraviolet radiation, a major cause of skin cancer. The hydrofluorocarbon (HFC) and hydrochlorofluorocarbon (HCFC) compounds, which have been developed as an alternative to CFC, require more hydrofluoric acid than CFC and are expected to boost fluorite consumption. These greenhouse gases are being phased out in stages. It is reported that even if CFC emission is stopped, the present level of these gases may take up to ten years to reach the upper atmosphere where they could persist for a century or more.

According to United Nations Environment Programme (UNEP), an international agreement to curtail illegal trade in CFC and other ozone depleting chemicals came into effect on 10<sup>th</sup> November 1999. The agreement, which was authorised through an amendment to the Montreal Protocol in 1997, requires nations to create licensing system for international sales of ozone depleting chemicals. Further, as a part of the Montreal Protocol, 129 nations agreed on a three-year funding package to enable developing countries to continue their efforts to phase out CFC and other ozone depleting chemicals, and

accordingly, the Fund's Executive Committee approved major agreements with China and India to finance the shutdown of CFC production facilities in the two countries during the next ten years.

The United Nations Environment Programme (UNEP) has prepared a Montreal Protocol Handbook that provides additional detail and explanation of the provisions. CIESIN's Thematic Guide on Ozone Depletion and Global Environmental Change presents an in-depth look at causes, human and environmental effects, and policy responses to stratospheric ozone depletion.

## WORLD REVIEW

The world total reserves of fluorite were 270 million tonnes. World reserves are concentrated mainly in South Africa & China (15% each) followed by Mexico (12%), Mongolia (8%) and Spain (2%) (Table- 7).

World production of fluorite in 2015 decreased slightly to 6.38 million tonnes as against 6.41 million tonnes during the previous year. (Table-8). As per industrial mineral report on fluorspar, end-use markets for fluorspar remained weak throughout the year due to the slowdown in global construction and a slump in fluorochemicals demand. Congestion in the fluorine supply chain pulled operating rates in China's aluminium fluoride (AlF<sub>3</sub>) sector down as low as 45% in year 2016.

Prices for both acidspar and metspar began at low levels in year 2016, due to a combination of oversupply and weak end market demand as a result of the slowdown in global construction markets. China (60%), Mexico (17%) and Mongolia (5%) were the principal producing countries of fluorite in 2015-16 (Table-8).

### China

As per USGS report on fluorite, 2015, China reported fluorspar reserves of 40 MT for 2014, significantly higher than the most recent USGS estimate of 24 MT. The trend of reported reserves suggests ongoing exploration and development of China's fluorspar resources.

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### Germany

To comply MAC directive, automobile manufacturer Daimler AG (Daimler) announced that it will introduce CO<sub>2</sub> based air-conditioning system in specific model of passenger car in 2017. Daimler objected to its use and said it was unable to implement the technology. If successfully deployed, the CO<sub>2</sub> based system would represent the first viable alternative to fluorinated MAC refrigerants.

### Kenya

Kenya fluorspar company suspended operations at its processing plant in western Kenya for two months in June 2015 citing quality issues, reduced global demand and competition from new producers. The company intended to sell 30,000 t of accumulated fluorspar stock prior to resuming operations.

### Canada

The Government of Newfoundland and Labrador, Department of Environment and Conservation, spared the St. Lawrence AGS vein fluorspar project from further environmental review. The project, proposed by Canada Fluorspar Inc., would include four open pit and underground mine operations, capable of storing 2.8 MT of flotation tailings, a mill facility capable of processing 200,000 metric tons per year of fluorspar flotation concentrate.

### United Arab Emirates

Gulf Fluor LLC opened a new fluorine industrial complex in Abu Dhabi. Production facilities include a 60,000 t/yr AlF<sub>3</sub> plant, a 54,000 t/yr anhydrous HF plant, and a 140,000 t/yr sulfuric acid plant.

### United Kingdom

Mexichem closed its HF production plant in Runcorn and withdrew financial support of Fenix Fluor Ltd, due to price decline of HF in Europe resulting from oversupply in China and the shutdown of numerous operations.

### Bulgaria

Solvay SA announced to cease operations in Chiprovtsi fluorspar mine. The company cited reduced demand and depletion of quality ore.

**Table – 7 : World Reserves of Fluorite  
(By Principal Countries)**

(In '000 tonnes)

Country	Reserves
<b>World: Total (rounded)</b>	<b>270000</b>
Brazil	640
China	41000
Iran	3400
Kenya	5000
Mexico	32000
Mongolia	22000
Morocco	580
South Africa	41000
Spain	6000
USA	4000
U K	4000
Vietnam	5000
Other countries	110000

*Source: Mineral Commodity Summaries, 2018.*

**Table – 8 : World Production of Fluorite  
(By Principal Countries)**

(In '000 tonnes)

Country	2013	2014	2015
<b>World: Total</b>	<b>6520</b>	<b>6412</b>	<b>6378</b>
Argentina <sup>(e)</sup>	23	23	23
Brazil <sup>(b)</sup>	28	24	25 <sup>e</sup>
Bulgaria	83	131	147
China <sup>(e)</sup>	4000	3800	3800
Germany	49	58	50
Iran	56	54	60 <sup>e</sup>
Kazakhstan <sup>(e)</sup>	110	100	100
Kenya	72	97	70
Mexico	1210	1110	1096
Mongolia	338	338 <sup>e</sup>	338 <sup>e</sup>
Morocco	81	80	81
Namibia	63 <sup>e</sup>	29	0
South Africa <sup>(e)</sup>	175	285	200
Spain	129	135	135
Vietnam	4 <sup>e</sup>	91	193
Other countries	99	57	60

*Source: World Mineral Production, 2011-2015.*

*b:- Including beneficiated and directly shipped material.*



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**FOREIGN TRADE**

**Exports**

Export of aluminium fluoride was 321 tonnes in 2016-17. Exports were mainly to UAE and Japan (50% each). Exports of fluorite decreased substantially to 316 tonnes in 2015-16 from 561 tonnes in the previous year. Exports were mainly to Indonesia (40%) and Bangladesh (24%). Exports of aluminium fluoride also decreased to 1,795 tonnes in 2015-16 as compared to 2,831 tonnes in the previous year. Exports were mainly to UAE (85%), Japan (11%) and Nigeria (4%). Exports of hydrofluoric acid increased slightly in 2015-16 to 2,792 tonnes against 2,291 tonnes in the previous year (Tables- 9 to 12).

**Imports**

Imports of aluminium fluoride was 46564 tonnes in 2016-17. Imports were mainly from UAE (41%), Indonesia (16%) and Italy (13%). Imports of fluorite increased considerably to 1.63 lakh tonnes in 2015-16 as compared to 1.55 lakh tonnes in the previous year. Imports were mainly from China (48%), Thailand (20%), Kenya (14%) & South Africa (8%). Imports of aluminium fluoride slightly decreased to 27,258 tonnes in 2015-16 from 30,120 tonnes in the previous year. Imports were mainly from UAE (34%), China (32%) and Italy (29%). On the other hand, imports of hydrofluoric acid increased marginally to 2,251 tonnes in 2015-16 from 2,156 tonnes in the previous year. Imports were mainly from China (75%) and Chinese Taipei/Taiwan (24%) (Tables- 13 to 16).

**Table – 9 : Exports of Aluminium Fluoride, 2016-17 (P)  
(By Countries)**

Country	2016-17(P)	
	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>321</b>	<b>26455</b>
UAE	160	10254
Japan	160	16088
Other Countries	1	113

Source: Export-Import Data Bank, HS Code:28261200

**Table – 10 : Exports of Fluorite  
(By Countries)**

Country	2014-15		2015-16(P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>561</b>	<b>20763</b>	<b>316</b>	<b>11581</b>
Indonesia	191	8633	126	4983
Bangladesh	105	2693	76	2284
Brazil	48	2469	35	1789
Nigeria	-	-	46	1381
Egypt	24	619	14	465
Angola	-	-	10	258
Pakistan	1	50	4	141
Kenya	2	70	2	102
Qatar	++	130	2	68
Vietnam	-	-	++	58
Other countries	190	6099	1	52

**Table – 11 : Exports of Aluminium Fluoride  
(By Countries)**

Country	2014-15		2015-16(P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>2831</b>	<b>197961</b>	<b>1795</b>	<b>123987</b>
UAE	2480	171971	1520	101786
Japan	150	14045	200	19545
Nigeria	-	-	75	2437
Nepal	1	27	++	154
Iran	-	-	++	32
Oman	-	-	++	26
Mauritius	-	-	++	4
Maldives	++	9	++	2
Brazil	200	11892	-	-
Malaysia	++	17	++	1

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**Table – 12 : Exports of Hydrofluoric Acid  
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>2291</b>	<b>162607</b>	<b>2792</b>	<b>161046</b>
Korea, Rep. of	723	37501	1867	90310
Thailand	480	35661	431	33598
Japan	242	22245	118	9583
Singapore	126	18402	36	5426
Saudi Arabia	135	9141	72	4349
Indonesia	257	16771	73	4237
UAE	21	1936	31	3216
Bangladesh	93	5833	36	2380
USA	18	1029	36	2168
Pakistan	88	4940	32	1681
Other countries	108	9148	60	4098

**Table – 13 : Imports of Fluorite  
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>155673</b>	<b>2967071</b>	<b>163113</b>	<b>2908708</b>
China	73996	1459578	77895	1419129
Thailand	35198	611103	33102	589237
Kenya	29051	537254	23099	412467
South Africa	11998	236548	12302	206149
Vietnam	400	6109	12628	192571
Norway	2391	54681	2193	54737
Turkey	483	11306	757	13537
Pakistan	585	8611	654	9394
Germany	101	4357	100	3857
UAE	550	12822	108	2663
Other countries	920	24702	275	4967

**Table – 14 : Imports of Hydrofluoric Acid  
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>2156</b>	<b>157766</b>	<b>2251</b>	<b>151942</b>
China	1950	142295	1695	114581
Chinese Taipei/Taiwan	202	13142	550	34947
UK	3	1554	3	1120
France	-	-	2	516
Germany	++	285	++	311
Sweden	-	-	++	172
Belgium	1	242	1	146
Spain	-	-	++	97
USA	++	48	++	52
Japan	++	200	-	-

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**Table – 15 : Imports of Aluminium Fluoride, 2016-17 (P)  
(By Countries)**

Country	2016-17 (P)	
	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>46564</b>	<b>2643714</b>
China	4978	332396
UAE	19036	1207617
Italy	6156	403583
Indonesia	7540	430314
USA	-	-
Qatar	4689	49627
Jordan	4051	216682
Other countries	114	3495

Source: Export-Import Data Bank, HS Code:28261200

**Table – 16 : Imports of Aluminium Fluoride  
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>30120</b>	<b>2025904</b>	<b>27258</b>	<b>1810222</b>
China	21583	1450498	8798	612585
UAE	-	-	9314	595564
Italy	5536	375122	8046	531724
Indonesia	3000	200030	1000	66532
USA	1	254	100	3813
Qatar	-	-	++	3
UK	-	-	++	1

## FUTURE OUTLOOK

The major driving factors for fluorite market are the growing chemical industry and increasing use of fluorite in cement, iron & steel, glass etc. industries. The chemical industry and glass industry accounts for the major share of the fluorite demand globally. As per TANFAC Annual Report 2016-17, global fluoro-chemical market is expected to reach USD 27.6 billion by 2022, growing at a CAGR of 5.6% from 2014 to 2022.

As per USGS report, improvements in steel making technology have also reduced the unit consumption of fluorite per unit tonnes of steel produced. In less developed countries, the quantity of fluorite used as a flux in steel making continues to be much higher, but further efficiency improvements are expected to moderate growth.

As on 01.04.2015, the resources of fluorite in India are 18.18 million tonnes which is considered to be limited resource. Ambadungar Fluorspar Mine of GMDC is the only domestic source of acid grade fluorite, slightly inferior in quality with high phosphorus content. Hence, to meet the

requirements, the domestic chemical industry will have to depend, both qualitatively and quantitatively on imported fluorite in the coming years, both for direct use and for blending with the domestic acid grade fluorite.

The import trend of fluorite showing 5% increase during 2015-16, while import of hydrofluoric acid increased by 4%. On the other hand consumption of fluorite also increased 63,500 tonnes in year 2015-16 as compared to 63,100 tonnes in year 2014-15. As per the Report of the Working Group for 12<sup>th</sup> plan period (2012-17), the average total consumption of fluorite by all industries has been around 72,000 tonnes per annum. The Working Group has estimated the apparent domestic demand of fluorite at 285 thousand tonnes by 2016-17 at 9% growth rate. The Working Group has recommended that cluster mining approach may be adopted in order to utilise the small deposits for further industrialisation of the mining area in the sector which will improve the workability of small mines. It has also suggested R&D for beneficiation and setting up of facilities to utilise fluorite from other parts of the country in the Chemical Industry.