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SULPHUR & PYRITES

(FINAL RELEASE)

GOVERNMENT OF INDIA
MINISTRY OF MINES
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46 Sulphur and Pyrites

Sulphur is an essential raw material for many chemical industries and is essentially used for the production of sulphuric acid which in turn is used for the production of chemical fertilizers, textiles, dyestuffs, pickling and galvanising of steel, storage batteries, refining of petroleum, explosives and other acids.

In India, presently there are no mineable elemental sulphur reserves. Sulphur combines directly with almost all the elements with the exception of gold, platinum and the noble gases. In its native form, sulphur is a yellow crystalline solid. It can be found as a pure element or as sulphate or sulphide minerals. The crystallography of sulphur is complex. Depending on the specific conditions, the sulphur allotropes form several distinct crystal structures, with rhombic and monoclinic S_8 best known.

Pyrites is naturally occurring mineral comprised of the elements iron and sulphur (FeS_2). It is used for manufacture of sulphuric acid, and as direct feed for soil conditioning. Pyrites is a fairly ubiquitous mineral and it occurs most commonly in sedimentary rocks. Pyrites has a brass yellow colour, brownish black streak, metallic lustre and occurs as cubic crystals. Pyrites includes a range of sulphide materials, such as marcasite, pyrite, and pyrrhotite. Marcasite usually occurs in low temperature metasediments and sedimentary rocks. Pyrrhotite occurs usually in magmatic or contact metasomatic deposits associated with basic igneous rocks and high temperature sulphide veins and is often nickeliferous. Pyrites was used as a substitute for sulphur in the manufacture of sulphuric acid. However, there was no production of pyrites since 2003.

Native sulphur deposit has been reported in Puga Valley of Leh district of Jammu & Kashmir. The grade of the deposit ranges from 9% to 24% of sulphur. Small occurrences of native sulphur are also reported from Barran Island of the Bay of Bengal. Sulphur along with hot springs was reported from various parts of Chamoli, Rudraprayag, Uttarkashi, etc. districts in Garhwal & Kumaun divisions of Uttarakhand. In Andhra Pradesh, native sulphur occurs in granular form with clay and silt in coastal areas of Krishna and East Godavari districts. Occurrences are also reported from Alleppy district of Kerala and Kangra district of Himachal Pradesh.

Sulphide occurs naturally in mineral ores, oil and coal deposits. Natural waters containing elevated concentrations of hydrogen sulphide are used for therapeutic baths and have been consumed for medical purposes. Hydrogen sulphide (H_2S), which exists as a colourless gas under normal conditions, has a characteristic odour of rotten eggs and occurs naturally in coal, natural gas, oil, volcanic gases and sulphur springs and lakes; H_2S is a central participant in the sulphur cycle, the biogeochemical cycle of sulphur on earth. Sulphides form an indispensable link in the sulphur cycle (the reversible interconversion of sulphide and sulphate) in nature.

Petroleum refineries and gas processing plants extract H_2S when making “clean fuels” and use it as a feed stock to produce sulphur and water. The domestic production of elemental sulphur is limited to by-product recoveries from petroleum refineries and fuel oil used as feedstock for manufacturing fertilizer. Tar sands-natural sand (Oil sands) formations containing about 10% bitumen and with high hydrogen sulphide content.

The sulphide ores contain sulphur and during the production of metal from sulphide ores, sulphur is released as SO_2 which is used to produce sulphuric acid. The sulphuric acid thus produced contains about 32.7% of sulphur and contributes in the industries which otherwise would have used elemental sulphur.

RESERVES/ RESOURCES

Total reserves/ resources of pyrites in the country as per NMI data, based on UNFC system as on 1.4.2015 have been placed at 1,674 million tonnes. There are no reserves and all resources are grouped under 'Remaining resources' category. Out of these, about 27 million tonnes are under feasibility (STD211) category. Out of the total resources, beneficiable grade resources are 62 million tonnes, low grade 1,555 million tonnes and soil reclamation grade resources are about 6 million tonnes. Balance of about 51 million tonnes resources falls under unclassified/ not-known grades. Major reserves/ resources are located in Bihar (94%) and Rajasthan (5%) (Table - 1).

Reserves/ resources of sulphur (native) have been estimated in the inferred (STD333) category only. Entire resources are located in Jammu & Kashmir (100%) and are placed at 0.21 million tonnes as on 1.4.2015 as per NMI data, based on UNFC System (Table-2).

Table – 1 : Reserves/Resources of Pyrites as on 1.4.2015 (By Grades and States)

(In '000 tonnes)

Grade/State	Reserves Total (A)	Remaining Resources						Total (A+B)
		Feasibility STD211	Pre-feasibility STD222	Measured STD331	Indicated STD332	Inferred STD333	Total (B)	
All India : Total	**–**	**27129**	**32597**	**9590**	**77729**	**1527356**	**1674401**	**1674401**
By Grades								
Soil Reclamation	–	–	3000	–	–	3024	6024	6024
Beneficiable	–	27129	29597	–	–	4902	61628	61628
Low	–	–	–	9590	26310	1519430	1555330	1555330
Unclassified	–	–	–	–	51419	–	51419	51419
By States								
Andhra Pradesh	–	–	–	–	–	880	880	880
Bihar	–	13462	9680	–	51419	1500000	1574561	1574561
Himachal Pradesh	–	–	–	–	–	2560	2560	2560
Karnataka	–	–	–	–	–	3000	3000	3000
Rajasthan	–	13667	22917	9590	26310	18392	90876	90876
Tamil Nadu	–	–	–	–	–	24	24	24
West Bengal	–	–	–	–	–	2500	2500	2500

Figures rounded off

Table – 2 : Reserves/Resources of Sulphur (Native) as on 1.4.2015 (By Grades and States)

(In '000 tonnes)

Grade/State	Reserves Total (A)	Remaining Resources						Total (A+B)
		Feasibility STD211	Pre-feasibility STD222	Measured STD331	Indicated STD332	Inferred STD333	Total (B)	
All India : Total	**–**	-	-	-	-	**210**	**210**	**210**
By Grades								
Sulphur (Native)	–	–	-	–	–	210	210	210
By States								
Jammu & Kashmir	–	–	–	–	–	210	210	210

Figures rounded off

PRODUCTION & STOCKS

Sulphur

The production of sulphur recovered as by-product from fertilizer plants and oil refineries was 825 thousand tonnes in 2017-18 as against 561 thousands tonnes in the preceding year.

The oil refineries in public sector reported production of sulphur. During the year 2017-18, Indian Oil Corp. Ltd contributed about 74% of the total production during the year. Among the states, Haryana accounted for 21.86% of the total sulphur production and it was followed by Gujarat 11.55%, Odisha 28%, Maharashtra 7.14%, Uttar Pradesh 5.78%, West Bengal 4.93%, Kerala 18.87% and the remaining production was contributed by Assam and Bihar.

In addition, refineries of Hindustan Petroleum Corp. Ltd and RIL, Essar oil also recover by-product sulphur which is in turn used as feedstock in manufacturing fertilizers and pharmaceuticals. The Vadinar refinery of Essar Oil Ltd is also reported to produce by-product sulphur. In Fertilizer Industry, the sulphuric acid is further used for manufacturing phosphoric acid and single superphosphate (SSP) from rock phosphate (Tables - 3 to 5).

Pyrites

Pyrites Phosphates and Chemicals Ltd (PPCL) had two pyrites production units located at Amjhore (Bihar) and Saladipura (Rajasthan) besides phosphorite division in Dehradun. The Government approved closure and hiving off of these two units in July 2002 and Amjhore unit in June 2003 and since then no activity is reported.

Petroleum Refining

In fossil fuels, sulphur is naturally present as an impurity when fuel is burned, the sulphur is released as sulphur dioxide-an air pollutant. Hydrodesulfurization (HDS) is a catalytic chemical process widely used to remove sulfur from natural gas and from refined petroleum products, such as gasoline or petrol, jet, fuel, kerosene, diesel and fuel oils. Sulphur is a by-product produced in various refineries processing high sulphur crude oil. Sulphur is produced from the sulphur rich fuel gas to reduce the emission level of sulphur in the atmosphere along with flue gases from the furnaces. Mathura refinery started production of sulphur from beginning itself and Sulphur recovery units have been provided in Haldia, Koyali, Panipat, Mathura & Guwahati refineries.

Refinery-wise sulphur production capacity of Indian Oil Corporation Ltd is as under:

Unit	Production Capacity ('000 MTPA)
Mathura	48.0
Haldia	24.0
Koyali	18.0
Panipat	144.0
Barauni	12.0
Guwahati	0.6

Specification of Sulphur at Mathura, Panipat, Koyali, Haldia, Barauni & Guwahati Refineries is as under:

Property	
Purity	99.9
Colour	Yellow
Shape	Lump

Table - 3 : Principal Producers of by-product Sulphur, 2017-18

Name & address of producer	Location of plant/refinery	
	State	District
Indian Oil Corporation Ltd, (Refineries Division), Scope Complex, Core-II, 7, Institutional Area, Lodhi Road, New Delhi -110 003.	Assam Bihar Gujarat Haryana Odisha Uttar Pradesh West Bengal	Kamrup Metro, Tinsukia Chirang Begusarai Vadodra Panipat Jagatsinghpur Mathura Purba Midnapur
Numaligarh Refinery Limited, 122S, G. S. Road, Christanbasti, Distt- Guwahati, Assam - 781 005.	Assam	Golaghat
Bharat Petroleum Corporation Ltd, Ernakulam Bharat Bhavan, 4 & 6, Currimbhoy Road, Ballard Estate, Mumbai-400 001, Maharashtra	Maharashtra Kerala	Mumbai

Note: Sulphur is recovered as by-product from fertilizer plants and oil refineries (excluding units working under private sector)

Table – 4 : Production of by-product Sulphur 2015-16 to 2017-18 (By States)

(In tonnes)

State	2015-16	2016-17	2017-18 (P)
India	**473322**	**560826**	**825173**
Assam	4312	6559	8051
Bihar	5561	8159	7330
Gujarat	101743	100952	95343
Haryana	178688	190946	180431
Kerala	32169	33287	155695
Maharashtra	56670	48991	58904
Odisha	-	86734	231075
Uttar Pradesh	47836	46618	47691
West Bengal	46343	38580	40653

(P): Provisional

Table – 5 : Production of by-product Sulphur 2016-17 and 2017-18 (By Sectors/States/Districts)

(In tonnes)

State/District	2016-17		2017-18 (P)	
	No. of units	Quantity	No. of units	Quantity
India/ Public sector	**12**	**560826**	**12**	**825173**
Assam	**4**	**6559**	**4**	**8051**
Chirang	1	1445	1	1548
Tinsukia	1	279	1	523
Kamrup Metro	1	726	1	643
Golaghat	1	4109	1	5337
Bihar/ Begusarai	1	8159	1	7330
Gujarat/ Vadodra	1	100952	1	95343
Haryana/ Panipat	1	190946	1	180431
Kerala/ Ernakulam	1	33287	1	155695
Maharashtra/ Mumbai	1	48991	1	58904
Odisha/ Jagatsinghpur	1	86734	1	231075
Uttar Pradesh/ Mathura	1	46618	1	47691
W. Bengal/				
Purba Midnapur	1	38580	1	40653

(P): Provisional

USES

Flowers of sulphur (sublimed sulphur)

Powdered form of sulphur produced by sublimation may contain up to 30% of the amorphous allotrope used in rubber vulcanisation, agricultural dusts, pharmaceutical products and stock feeds.

Sulphur dioxide (SO_2)

Sulphur dioxide is a by product gas generated during processing of sulphide ores as well from other industries. It is used in many industrial processes such as chemical preparation, refining, pulp-making and solvent extraction and also is the feed stock to manufacture sulphuric acid. Sulphur dioxide is also used in the preparation and preservation of food because it prevents bacterial growth and browning of fruit.

Sulphuric acid

Sulphuric acid is product of sulphur, a strong mineral acid with the formula H_2SO_4. It is soluble in water at all concentrations. Sulphuric acid has many applications and is produced in greater amounts than any other chemical besides water. Principal uses include ore processing, fertilizer manufacturing, oil refining, waste water processing and chemical synthesis.

Miscellaneous

One of the direct uses of sulphur is in vulcanisation of rubber. Sulphur is a component of gunpowder. It reacts directly with methane to give carbon disulphide, which is used to manufacture cellophane and rayon.

Elemental sulphur is mainly used as a precursor to other chemicals. Most of the sulphur is converted to sulphuric acid (H_2SO_4), which is of prime importance to the world economy.

The production and consumption of sulphuric acid are an indicator of a nation's industrial development. The principal use of the sulphuric acid is in the manufacture of phosphatic fertilizer.

Other applications of sulphuric acid include oil refining, waste water processing and mineral extraction. Sulphur compounds are also used in detergents, fungicides, dyestuffs and agrichemicals. In silver based photography, sodium and ammonium thiosulphate are used as "fixing agents". Sulfites, derived

from burning sulphur, are used to bleach paper. They are also used as preservatives in dried fruit and processed fruit products.

Sulphur is used as a light-generating medium in the rare lighting fixtures known as "sulphur lamps". The sulphur lamp is a highly efficient full-spectrum electrodeless lighting system whose light is generated by sulphur plasma that has been excited by microwave radiation.

Nitrogen (N), phosphorus (P) and potassium (K) are critical components of a well-fertilized crop. But to achieve yields and more nutritious foods, crops need sulphur (S). It improves protein and oil percentage in seeds, cereal quality for milling and baking, marketability of dry coconut kernel (copra), quality of tobacco, nutritive value of forages, etc. It is associated with special metabolisms in plant and the structural characteristics of protoplasm. Judicious application in sulphur-deficient soils is a cost effective way to produce more food and feed.

Concrete binder made with sulphur is an eco-efficient alternative to conventional Portland cement for paving stones, sidewalks and building foundations. In road construction, sulphur technology can replace up to 30 percent of asphalt binder, a very energy intensive input in blacktop roads. Sulphur-enhanced roads and parking lots offer a longer life cycle.

INDUSTRY

The Dharamsi Morarji Chemical Company Limited (DMCC) was the first producer of sulphuric acid and Phosphate fertilizers in India. DMCC has designed and commissioned over 50 sulphuric acid plants from 50 MTPD to 1350 MTPD in India, Middle, Far-East and South Africa. DMCC has designed and commissioned Single Super Phosphate Plants from 50 MTPD to 1000 MTPD.

Trident Chemicals started as Varindra Agro Chemicals Ltd in the year 1985 with an initial production capacity of 36300 MTPA of sulphuric acid i.e.100 MTPD. In 2010 Trident Chemicals have extended with the state-of-the-art technology plant imported from QVF Germany to add up a new product line Sulphuric Acid LR grade with the production capacity of 33 MTPD.

Coromandel International Ltd (Coromandel) formerly Coromandal Fertilizers Limited (CFL) is a leading manufacturer of a wide range of fertilizers & pesticides. The plant located at Ennore, Tamil Nadu, would also expand the de-bottlenecking the existing sulphuric acid plant-1 & plant-2 from 1,400 MTPD to 1,700 and 300 MTPD to 400 MTPD respectively.

The present production facility of the Fertilizers and Chemicals Travancore Limited (FACT) includes manufacture of 3,30,000 MTPA of sulphuric acid of Cochin Division. As per annual report 2017-18 of FACT during the year 2017-18, the division produced 263,850 MT of sulphuric acid as compared to 254,650 MT of sulphuric acid in the year 2016-2017.

Gujarat State Fertilizers & Chemicals Limited (GSFC) has got two sulphuric acid plants with a rated capacity of 1350 MTPD & 400 MTPD. The 400 MTPD SA III plant was supplied and commissioned in 1981 by Simon Carves (India) Ltd on turnkey basis. The 1,350 MTPD SA IV plant was supplied and commissioned in 1993 by M/s Dharams Morarji Chemicals Company Ltd on turnkey basis. GSFC is contemplating to install 3000 MTPD sulphuric acid plant on EPC basis at its Sikka Unit. This will reduce the import dependency for sustaining the plant operation on continuous basis for production of Phosphatic Fertilizers at Sikka Unit. For sulphuric acid, possibilities are being explored for production of sulphuric acid from molten sulphur or direct purchase of sulphuric acid produced from smelter.

As per Annual report 2017-18 of HZL, company has seven sulphuric acid producing plants. Total sulphuric acid production of HZL was 14,04,095 MT during 2017-18 as compared to 11,82,698 MT during 2016-17.

Khaitan Chemicals & Fertilizers Group has Single Super Phosphate (SSP) production capacity of 11,13,500 MT along with Sulphuric Acid production capacity of 2,70,600 MT. The sulphuric acid plants are located at Nimrani, distt Khargone, M.P.; Goramachia, distt Jhansi, U.P.; Malwan, distt Fatehpur, U.P. and Somni, distt Rajnandgaon, Chhattisgarh. As per Annual Report 2017-18 of Khaitan Chemicals & Fertilizers Group, production of sulphuric acid was 94,873 MT during 2017-18 as compared to 1,05,792 MT in 2016-17.

Hindalco is one of the leading sulphuric acid manufacturers in India. The company has three sulphuric acid plants totalling a capacity of 16,70,000 tpa. Besides sulphuric acid, Hindalco is also a manufacturer of phosphoric acid in India.The plant designed to treat 285,000 tonnes of sulphuric acid and 300,000 tonnes of rock phosphates produces 180,000 tonnes of merchant-grade phosphoric acid (52 to 54 %) per year.

TRADE POLICY

Imports of sulphur of all kinds other than sublimed sulphur, precipitated sulphur and colloidal sulphur under heading No. 2503 are allowed freely under the Foreign Trade Policy (FTP), 2015-20. Similarly, the imports of unroasted iron pyrites under heading No. 2502 are allowed free.

WORLD REVIEW

The world sulphur industry remained divided into two sectors, discretionary and non-discretionary sector, the mining of sulphur or pyrites is the sole objective, this voluntary production of either sulphur or pyrites (mostly naturally occurring iron sulphide) is based on the mining of discrete deposits, with the objective of obtaining as nearly a complete recovery of the resource as economic conditions permit. Reserves of sulphur in crude oil, natural gas and sulphide ores are large. As most sulphur production is a result of the processing of fossil fuels, supplies should be adequate for the foreseeable future.

As petroleum and sulphide ores can be processed long distances from where they are produced, sulphur production may not be in the country for which the reserves were attributed. For instance, sulphur reserves from Saudi Arabia may be recovered at oil refineries in the United States or elsewhere in the world.

In 2017, the world production of sulphur was estimated at 74.90 million tonnes and that of pyrites at 8.10 million tonnes in terms of sulphur content as compared to 74.80 million tonnes & 8 million tonnes respectively in the preceeding year (Table-6).

Elemental sulphur is obtained from ores by conventional mining or by the Frasch method of mining or as a by-product of sour natural gas processing, sour crude refining, tar sand processing and stack gas clean-up (recovered sulphur). Recovered sulphur production accounted for over 98% world elemental sulphur production.

In Frasch method, three concentric pipes are used. The outermost pipe contains superheated water, which melts the sulphur, and the innermost pipe is filled with hot compressed air, which serves to create foam and pressure. The resulting sulphur foam is then expelled through the middle pipe. The Frasch process produces sulphur with 99.5% purity content, and it needs no further purification. Frasch sulphur production on a commercial scale was operated in Brazil and Mexico. Elemental/native sulphur was mined in China, Poland and Russia.

To give a generalised view of the development in various countries the country-wise description is sourced from latest available publication of Minerals Year Book 'USGS' 2015 is furnished below:

USA

USA ranked 2nd in world in sulphur production and in 2015 sulphur production in USA was about 9.3 million tonnes.

China

China was the only country among the top producers whose primary sulphur source was pyrites. China accounted for about 94% of world pyrites production. China was the leading producers of sulphur in all forms. Fertilizer production consumed about two-third of the sulphuric acid produced in China.

Table – 6 : World Production of Sulphur & Pyrites (By Principal Countries)

(In '000 tonnes of sulphur content)

Country	2015	2016	2017
World: Total (Sulphur)	**74500**	**74800**	**74900**
(Pyrites) (rounded off)	**8200**	**8000**	**8100**
Brazil (Sulphur)[ab]	514	531	531
(Pyrites)	20	20	20
Canada (Sulphur)[ab]	5745	5381	5464
China (Sulphur)[d]	12500	12500	12500
(Pyrites)	7700	7700	7700
Chile (Sulphur)[b]	1488	1596	1524
Finland (Pyrites)	353	206	291
(Sulphur)[ab]	479	480	474
Germany (Sulphur)[ac]	1012	930	866
India (Sulphur)[abf]	2700	2700	2700
Iran (Sulphur)[d]	2200	2200	2200
Italy (Sulphur)[ad]	740	550	550
Japan (Sulphur)[ab]	3363	3518	3372
Jordan (Sulphur)[a]	490	490	490
Kazakhstan (Sulphur)[ab]	3119	3151	3551
Netherlands (Sulphur)[ab]	517	522	496
Peru (Sulphur)[d]	556	556	556
Turkey (Pyrites)	22	61	31
(Sulphur)[acd]	74	73	78
Turkmenistan (Sulphur)[a]	410	410	410
Korea, Rep. of (Sulphur)[ab]	2528	3078	3078
Mexico (Sulphur)[ab]	1415	1229	1107
Poland (Sulphur)[abe]	931	925	966
Russia (Sulphur)[acd]	7156	7140	7142
(Pyrites)	71	71	71
Saudi Arabia (Sulphur)[a]	3800	3900	3700
South Africa (Sulphur)[ab]	277	280	257
USA (Sulphur)[ab]	9536	9743	9660
UAE (Sulphur)[a]	2530	2530	2530
Venezuela (Sulphur)[a]	450	410	360
Spain (Sulphur)[ab]	1054	1054	1054
Qatar (Sulphur)[a]	1724	1733	1678
Other countries (Sulphur)	7193	7191	7605

Source: *World Mineral Production, 2013-2017 (BGS)*

a :- From petroleum refining and/or natural gas.

b :- From metal sulphide processing.

c :- Other; d :- Sulphur, all forms; e: Including frasch

f:- Years ended 31st March following that stated.

FOREIGN TRADE

Exports

Exports of sulphur (excluding sublimed, precipitated and colloidal) decreased by 7% to 5,73,855 tonnes in 2017-18 as compared to 6,16,472 tonnes tonnes in the preceding year. Exports were mainly to China (86%), New Caledonia (7%) & Indonesia (6%). On the other hand exports of sulphur (including sublimed, precipitated and colloidal) increased marginally by 4% to 17,697 tonnes in 2017-18 as compared to 17,020 tonnes in the preceding year. Exports were mainly to Netherlands (20%), USA (12%), Thailand (10%) & Indonesia (8%) (Tables-7 to 11).

Imports

Imports of sulphur (excluding sublimed, precipitated and colloidal) decreased by 10% to 1.21 million tonnes in 2017-18 from 1.35 million tonnes in the previous year. Imports were mainly from UAE (30%), Qatar (28%), Saudi Arabia (22%), Bahrain (7%) and Japan (6%). Imports of sulphur (including sublimed, precipitated and colloidal) increased considerably by 88% to 467 tonnes in 2017-18 from 249 tonnes in the previous year. Imports were mainly from China (48%), Korea Rep. of (15%), Germany (12%), and USA (11%) (Tables -12 to 16).

Table – 7 : Exports of Sulphur (Excl. Sublimed, Precipitated & Colloidal) :Total (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**616472**	**3469350**	**573855**	**4254429**
China	521873	2885689	492127	3757712
New Caledonia	-	-	41800	223625
Indonesia	60500	340083	35300	177775
Sri Lanka	825	13949	1257	20710
Turkey	99	7411	231	17110
Nepal	455	5816	873	13494
Oman	2105	21304	1071	10068
Bangladesh	-	-	274	5421
Brazil	2019	22386	56	5051
UAE	114	4693	95	3944
Other countries	28482	168019	771	19519

Table –8 : Exports of Sulphur (Sublimed, Precipitated & Colloidal) : Total (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**17020**	**1861386**	**17697**	**1896120**
Netherlands	3677	421800	3588	420077
USA	1892	217225	2125	216181
Thailand	1894	207630	1741	179382
Indonesia	808	87184	1415	144887
China	1121	124488	1213	120904
South Africa	926	111127	990	114698
Portugal	912	99489	936	103074
Brazil	1047	110549	989	98478
Iran	544	58766	987	96894
Spain	627	69559	799	85269
Other countries	3572	353569	2914	316276

Table – 9 : Exports of Sulphur (Colloidal)
(By Countries)

Country	2016-17		2017-18	
	Quantity (t)	Value (`'000)	Quantity (t)	Value (`'000)
All Countries	**43**	**1179**	**8**	**522**
UAE	3	178	8	453
Nepal	32	578	++	49
Malawi	-	-	++	10
Singapore	-	-	++	4
Qatar	-	-	++	2
Georgia	-	-	++	2
Zambia	-	-	++	1
Netherlands	-	-	++	1
Jordan	++	1	-	-
Congo, Dem. Rep.	1	12	-	-
Other countries	7	410	-	-

Table – 10 : Exports of Sulphur (Sublimed)
(By Countries)

Country	2016-17		2017-18	
	Quantity (t)	Value (`'000)	Quantity (t)	Value (`'000)
All Countries	**16842**	**1855513**	**17637**	**1894934**
Netherlands	3677	421800	3588	420076
USA	1892	217225	2125	216181
Thailand	1894	207630	1741	179382
Indonesia	793	86370	1415	144887
China	1121	124488	1213	120904
South Africa	926	111127	990	114696
Portugal	912	99489	936	103074
Brazil	1040	110139	989	98478
Iran	544	58766	987	96894
Spain	627	69559	799	85269
Other countries	3416	348920	2854	315093

Table-11 : Exports of Sulphur (Precipitated)
(By Countries)

Country	2016-17		2017-18	
	Quantity (t)	Value (`'000)	Quantity (t)	Value (`'000)
All Countries	**135**	**4694**	**52**	**664**
Nepal	113	2179	52	598
Sri Lanka	++	16	++	24
Russia	-	-	++	24
Zimbabwe	-	-	++	9
New Zealand	-	-	++	4
South Africa	-	-	++	2
Ethiopia	-	-	++	1
Qatar	-	-	++	1
UAE	1	129	++	1
Malawi	6	1512	-	-
Other countries	15	858	-	-

Table – 12 : Imports of Sulphur (Excl. Sublimed, Precipitated & Colloidal): Total
(By Countries)

Country	2016-17		2017-18	
	Quantity (t)	Value (`'000)	Quantity (t)	Value (`'000)
All Countries	**1345520**	**8751428**	**1206433**	**10628790**
UAE	244557	1535046	364417	3356574
Qatar	312818	1974246	332893	2942291
Saudi Arabia	548366	3597521	262115	2052763
Bahrain	56909	365002	80298	769177
Japan	70190	483295	74286	717498
Turkmenistan	4871	29642	30727	267791
Morocco	-	-	27502	175662
Singapore	4734	35525	13264	104477
Korea, Rep. of	884	8008	5961	82590
Kuwait	52503	351483	6998	64304
Other countries	49688	371660	7972	95663

Table – 13 : Imports of Sulphur (Sublimed, Precipitated & Colloidal): Total (By Countries)

Country	2016-17		2017-18	
	Quantity (t)	Value (`'000)	Quantity (t)	Value (`'000)
All Countries	**249**	**38254**	**467**	**56993**
China	38	6088	226	25076
Germany	50	11167	54	10101
USA	18	1571	50	6625
Korea, Rep. of	48	3003	69	5919
Vietnam	-	-	30	3273
Japan	12	2009	12	1802
Spain	22	2239	15	1692
Chinese Taipei/ Taiwan	18	4654	4	1076
Malaysia	-	-	4	524
UK	++	327	1	455
Other countries	43	7196	2	450

Table – 14 : Imports of Sulphur (Precipitated) (By Countries)

Country	2016-17		2017-18	
	Quantity (t)	Value (`'000)	Quantity (t)	Value (`'000)
All Countries	**140**	**23567**	**47**	**6791**
Germany	30	4243	38	4109
Chinese Taipei/ Taiwan	18	4654	4	1076
Japan	3	890	3	882
Netherlands	-	-	2	335
USA	18	1313	++	122
Spain	++	25	++	96
Italy	2	292	++	62
China	28	5095	++	60
Denmark	-	-	++	39
Thailand	-	-	++	6
Other countries	41	7055	++	4

Table – 15 : Imports of Sulphur (Colloidal) (By Countries)

Country	2016-17		2017-18	
	Quantity (t)	Value (`'000)	Quantity (t)	Value (`'000)
All Countries	**66**	**9533**	**82**	**11122**
Germany	19	6476	16	5545
Korea, Rep. of	38	1793	57	4543
Japan	9	1119	9	875
USA	-	-	++	103
UK	++	145	++	52
France	-	-	++	3
Belgium	-	-	++	1

Table – 16: Imports of Sulphur (Sublimed)
(By Countries)

Country	2016-17		2017-18	
	Quantity (t)	Value (`'000)	Quantity (t)	Value (`'000)
All Countries	**43**	**5154**	**338**	**39080**
China	10	993	226	25016
USA	++	258	50	6400
Vietnam	-	-	30	3273
Spain	22	2214	15	1596
Korea, Rep. of	10	1192	12	1376
Malaysia	-	-	4	524
Germany	1	448	++	447
UK	++	49	1	403
Japan	-	-	++	45

FUTURE OUTLOOK

Country is deficient in sulphur and pyrites which are essential for fertilizer industry. Recovered sulphur output was expected to increase significantly worldwide. Refineries in developing countries were expected to improve environmental protection measures and eventually, compare with the environmental standards of plants in Japan, North America and Western Europe in future. Higher sulphur recovery is likely to result from several factors, viz, higher refining rates, higher sulphur content in crude oil, lower allowable sulphur content in finished fuels and reduced sulphur emissions mandated by regulations.

World consumption of natural gas is expected to maintain strong growth, and sulphur recovery from that sector will likely to continue to increase. Some of the future gas production is expected to come from unconventional natural gas resources such as shale gas and coal bed methane.

In the near term, increased global production and continued demand will keep the sulphur market balanced, which is expected to be followed in the long term by a surplus worldwide. International sulphur trade is expected to increase significantly, driven by demand for sulphuric acid in industrial sectors (particularly new ore-leaching operations) and a modest increase in demand for fertilizers.

According to TechSci Research report, Global Sulphur Fertilizers Market is projected to reach USD 6.35 Billion by 2023 at a CAGR of over 3% owing to the growing need of sulphur fertilizers for higher productivity due to the constantly growing demand for agriculture. Based on the type, the sulphur fertilizers segment is expected to lead the market in the next five years, as the plant can easily uptake the sulphur.