6.1 PHOSPHATE (APATITE)

Introduction

Apatite is the most abundant crystalline phosphate mineral found as an accessory mineral in practically all kinds of igneous rocks. Sometimes, it is concentrated in pegmatites, metallic veins and magmatic deposits. It also occurs in metamorphic rocks and as a secondary mineral in phosphatic rocks of sedimentary origin. Fluorapatite $Ca_5(PO_4)_3F$ is the most common variety of apatite and also a secondary sources of fluorine. It is chiefly used in fertilizer industry and also used in chemical, elemental phosphorus and sugar industries. In powdered form, it is directly applied for soil reclamation. India has inadequate resources of apatite especially of chemical/fertilizer grade.

Basis of Grade Classification

The following grade classification has been adopted for apatite in National Mineral Inventory as on 1.4.2015.

1.	Chemical/Fertilizer	(+) 30 % P_2O_5
2.	Blendable	25 to 30% P_2O_5
3.	Soil Reclamation	(+) 16% P_2O_5
4.	Beneficiable	(+) 10% P_2O_5
5.	Low/ Non-Beneficiable	(-) 10% P_2O_5
6.	Unclassified	Where the minimum and maximum values of chemical constituents are too wide to classify the resources under any grades.
7.	Not Kmown	Such estimation about which information/data is not available/reported to be classifiedit under any of the grades.

Basis of Categorisation of Resources

As per United Nations Framework Classifications (UNFC), the resources of apatite are broadly categorised into 'reserves' and 'remaining resources'.

According to the norms of this system, the reserves of apatite have been placed under proved (111) and probable (122) categories.

The remaining resources have been placed under feasibility (211), prefeasibility (221) & (222), measured (331), indicated (332), inferred (333) and reconnaissance (334) categories.

Salient Features of the Inventory

The total resources of apatite in the country as on 1.4.2015 are estimated at 24,045,477 tonnes, of these only 29,395 tonnes (0.1%) fall under reserves category, and the balance 24,016,082 tonnes (99.9%) are remaining resources.

All India scenario of apatite reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 have been given in Tables - 1 and 2. These tables give an idea about the significant changes in terms of increase or decrease of resources as per lease status, grades and states. In Table-3 district wise reserves/resources as on 1.4.2015 have been given.

Out of the total resources, 20,578,530 tonnes (86%) are in freehold and the balance 3,466,947 tonnes (14%) are in leasehold public sector.

The high grade resources of apatite containing (+) 30% P_2O_5, used in fertilizer/chemical industries, constitute only 1% of the total resources. Soil reclamation grade constitutes 53%, beneficiable grade 28%, low/non-beneficiable grade 13% and the remaining 5% resources are accounted together by blendable/ unclassified/not known grades.

The known resources of apatite in India are mostly confined to West Bengal (57%) and Jharkhand (30%) with minor quantities in Meghalaya (5%), Rajasthan (4%) and remaining 4% are in Gujarat, Tamil Nadu and Andhra Pradesh.

An analysis of district wise resources in the states reveals that about 96% of the total resources in the country is concentrated in only four districts. The largest share is held by Purulia district, West Bengal (57%), followed by Singhbhum East district, Jharkhand (30%), Jaintia Hills district, Meghalaya (5%) and Udaipur district, Rajasthan (4%). The remaining 4% resources are estimated in Visakhapatnam district, Andhra Pradesh, Panchmahal district, Gujarat, Dharmapuri & Vellore districts, Tamil Nadu and Sikar district, Rajasthan.

A net decrease of resources of about 183,269 tonnes has been recorded in the current inventory as compared to the previous inventory as on 1.4.2010. The decrease in resources was due to re-estimation of resources of Beldih mine Purulia district, West Bengal and Andhra

Table - 1 : Reserves/Resources of Phosphate (Apatite) as on 1.4.2015 vis-à-vis 1.4.2010 (By Lease Status/Grade)

(In tonne)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total	**29395**	**2090216**	**(-)2060821**	**24016082**	**22138530**	**(+)1877552**	**24045477**	**24228746**	**(-)183269**
Chemical Fertilizer	29395	37699	(-)8304	230163	230163	No Change	259558	267862	(-)8304
Soil Reclamation	-	1560699	(-)1560699	12710827	9276500	(+)3434327	12710827	10837199	(+)1873628
Low/Non-Beneficiable	-	-	-	3083006	4383006	(-)1300000	3083006	4383006	(-)1300000
Beneficiable	-	491818	(-) 491818	6799902	7056677	(-)256775	6799902	7548495	(-)748593
Blendable	-	-	-	2184	2184	No Change	2184	2184	No Change
Unclassified	-	-	-	1000000	1000000	No Change	1000000	1000000	No Change
Not Known	-	-	-	190000	190000	No Change	190000	190000	No Change
Freehold	**-**	**-**	**-**	**20578530**	**20381592**	**(+)196938**	**20578530**	**20381592**	(+)196938
Chemical Fertilizer	-	-	-	226938	30000	(+)196938	226938	30000	(+)196938
Soil Reclamation	-	-	-	9276500	9276500	No Change	9276500	9276500	(-)960000
Low/Non-Beneficiable	-	-	-	3083006	4383006	(-)1300000	3083006	4383006	(-)1300000
Beneficiable	-	-	-	6799902	5499902	(+)1300000	6799902	5499902	(+)1300000
Blendable	-	-	-	2184	2184	No Change	2184	2184	No Change
Unclassified	-	-	-	1000000	1000000	No Change	1000000	1000000	No Change
Not Known	-	-	-	190000	190000	No Change	190000	190000	No Change
Leasehold (Public)	**29395**	**2090216**	**(-)2060821**	**3437552**	**1756938**	**(+)1680614**	**3466947**	**3847154**	**(-)380207**
Chemical Fertilizer	29395	37699	(-)8304	3225	200163	(-)196938	32620	237862	(-)205242
Soil Reclamation	-	1560699	(-)1560699	3434327	-	(+)3434327	3434327	1560699	(+)1873628
Beneficiable	-	491818	(-)491818	-	1556775	(-)1556775	-	2048593	(-)2048593

figures rounded off.

Phosphate Mine, Vishakapatnam district, Andhra Pradesh. Both the mines were in public sector.

Out of the total resources of apatite, about 7,150,414 tonnes (30%) have been estimated under inferred and reconnaissance categories. These resources are based on a limited and preliminary exploration. If these areas are examined for further detailed exploration, the confidence level of resource position of apatite in the country may improve.

One leasehold deposit of Andhra Pradesh namely Kasipatanam hills was converted to freehold.

A total 20 deposits have been covered in the inventory as on1.4.2015 of which 18 deposits are in freehold areas and 2 deposits in leasehold public.

Table – 2 : Total Resources of Phosphate (Apatite) as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In tonne)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	**24045477**	**24228746**	**(-)183269**
Andhra Pradesh	229558	237862	(-)8304
Gujarat	351000	351000	No Change
Jharkhand	7270000	7270000	No Change
Meghalaya	1300000	1300000	No Change
Rajasthan	1067521	1067521	No Change
Tamil Nadu	240000	240000	No Change
West Bengal	13587398	13762363	(-)174965

Figures rounded off.

Table - 3 : District wise Reserves/Resources of Phosphate (Apatite) as on 1.4.2015

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	**29,395**	**24,016,082**	**24,045,477**
Andhra Pradesh	**29,395**	**200,163**	**229,558**
Visakhapatnam	29,395	200,163	229,558
Gujarat	**-**	**351,000**	**351,000**
Panchmahals	-	351,000	351,000
Jharkhand	**-**	**7,270,000**	**7,270,000**
Singhbhum (East)	-	7,270,000	7,270,000
Meghalaya	**-**	**1,300,000**	**1,300,000**
Jaintia Hills	-	1,300,000	1,300,000
Rajasthan	**-**	**1,067,521**	**1,067,521**
Sikar	-	37,521	37,521
Udaipur	-	1,030,000	1,030,000
Tamil Nadu	**-**	**240,000**	**240,000**
Dharmapuri	-	50,000	50,000
Vellore	-	190,000	190,000
West Bengal	**-**	**13,587,398**	**13,587,398**
Purulia	-	13,587,398	13,587,398

figures rounded off.

6.2 PHOSPHATE (PHOSPHORITE)

Introduction

Rock Phosphates (or phosphorites) are sedimentary phosphatic deposits comprising fine grained mixture of various calcium phosphates, most important being hydroxyl-apatite, carbonate-apatite, fluor-apatite and their solid solutions. About 80% phosphate production in the world is derived from phosphate rocks (phosphorite) containing one or more phosphatic minerals.

Rock phosphate is used primarily as a plant nutrient, either by direct application to the soil as a powdered product or in the manufacture of super-phosphate, triple super phosphate, or diammonium phosphate (DAP) fertilizers. Elemental phosphous and phosphoric chemicals derived from phosphate rock are also used in detergents, insecticides, matches, fireworks, military smoke screen, incendiary bombs, and any other products.

Basis of Grade Classification

The following grade classification has been followed in National Mineral Inventory as on 1.4.2015 :

1.	Chemical/Fertilizer	(+) 30% P_2O_5
2.	Blendable	25 to 30% P_2O_5
3.	Soil Reclamation	(+)16% P_2O_5
4.	Beneficiable	(+)5-10% P_2O_5
5.	Low/Non-beneficiable	(-) 5% P_2O_5
6.	Unclassified	Where range of maximum and minimum values of chemical constituents are too wide to be fitted in to any of the above grades.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system, reserves of rock phosphate have been placed under proved (111) and probable (121) & (122) categories.

The 'remaining resources' have been placed under feasibility (211), pre-feasibility (221) & (222), measured (331), indicated (332) inferred (333) and (334) categories.

Salient Features of the Inventory

The total resources of rock phosphate in the country as on 1.4.2015 are estimated at 312.68 million tonnes, of these 45.81 million tonnes(14.65%) fall under reserve category and the balance 266.87 million tonnes (85.35%) under 'remaining resource' category.

All India scenarios of rock phosphates reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 have been given in Tables - 1 and 2. These tables give an idea about the significant changes in terms of increase or decrease of resources as per lease status, grades and states. In Table-3 district wise reserves/resources as on 1.4.2015 have been given.

Out of the total resources, about 220.75 million tonnes (71%) are in freehold, 76.07 million tonnes (24%) in leasehold public and 15.86 million tonnes (5%) in leasehold private.

Out of the total resources of rock phosphate about 25.98 million tonnes (8%) constitutes chemical/fertilizer grade, 35.27 million tonnes (11%) blendable grade, 26.26 million tonnes (8%) soil reclamation grade, 89.73 million tonnes (29%) beneficiable grade, 115.55 million tonnes (37%) low grade, and 16.32 million (5%) resources are in unclassified, 3.58 million tonnes (1%) in not known grade.

Resources of rock phosphate have been estimated in seven states. Jharkhand is credited with 107.37 million tonnes (34%), followed by Rajasthan 95.68 million tonnes (31%), Madhya Pradesh 58 million tonnes (18%), Uttar Pradesh 25.77 million tonnes, Uttarakhand 24.18 million tonnes (8%) each and minor resources(1%) reported from Meghalaya and Gujarat. The entire resources estimated in Jharkhand constitute low grade, (-) 5% P_2O_5 material .

An overall increase of about 16 million tonnes of resources have been recorded in the inventory as on 1.4.2015, in comparison to the earlier inventory as on 1.4.2010. About 7.7 million tonnes resources increased in Banswara, Jaisalmer and Udaipur districts, Rajasthan

Table - 1 : Reserves/Resources of Phosphate (Phosphorite) as on 1.4.2015 vis-à-vis 1.4.2010 (By Lease Status/Grade)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total	**45807485**	**34778650**	**(+)11028835**	**266871130**	**261505701**	**(+)5365430**	**312678615**	**296284351**	**(+)16394264**
Chemical/ Fertilizers	9056829	9540342	(-)483513	16918245	7970200	(+)8948045	25975074	17510542	(+)8464532
Blendable	10923537	9595293	(+)1328244	24350429	18753719	(+)5596710	35273966	28349012	(+)6924954
Soil Reclamation	-	8861331	(-)8861331	26260082	25910133	(+)349949	26260082	34771464	(-)8511382
Beneficiable	25827119	6781684	(+)19045435	63899385	79189032	(-)15289647	89726504	85970716	(+)3755788
Low Grade	-	-	-	115547549	115271844	(+)275705	115547549	115271844	(+)275705
Unclassified	-	-	-	16320441	10835773	(+)5484668	16320441	10835773	(+)5484668
Not Known	-	-	-	3575000	3575000	No Change	3575000	3575000	No Change
Freehold	**-**	**-**	**-**	**220747745**	**179897034**	**(+)40850712**	**220747745**	**179897034**	**(+)40850712**
Chemical/ Fertilizers	-	-	-	2431213	1081200	(+)1350013	2431213	1081200	(+)1350013
Blendable	-	-	-	21696029	643346	(+)21052683	21696029	643346	(+)21052683
Soil Reclamation	-	-	-	20932729	17629966	(+)3302763	20932729	17629966	(+)3302763
Beneficiable	-	-	-	43071928	32794905	(+)10277023	43071928	32794905	(+)10277023
Low Grade	-	-	-	115547549	115271844	(+)275705	115547549	115271844	(+)275705
Unclassified	-	-	-	13493298	10835773	(+)2657525	13493298	10835773	(+)2657525
Not Known	-	-	-	3575000	1640000	(+)1935000	3575000	1640000	(+)1935000
Leasehold (Public)	**34883948**	**32660643**	**(+)223305**	**41185242**	**77636667**	**(-)36451425**	**76069190**	**110297310**	**(-)34228120**
Chemical/Fertilizers	9056829	9540342	(-)483513	14487032	6889000	(+)7598032	23543861	16429342	(+)7114519
Blendable	-	7477286	(-)7477286	543400	14138373	(-)13594973	543400	21615659	(-)21072259
Soil Reclamation	-	8861331	(-)8861331	5327353	8280167	(-)2952814	5327353	17141498	(-)11814145
Beneficiable	25827119	6781684	(+)19045435	20827457	46394127	(-)25566670	46654576	53175811	(-)6521235
Unclassified	-	-	-	-	-	-	-	-	-
Not Known	-	-	-	-	1935000	(-)1935000	-	1935000	(-)1935000
Leasehold (Private)	**10923537**	**2118007**	**(+)8805530**	**4938143**	**3972000**	**(+)966143**	**15861680**	**6090007**	**(+)9771673**
Blendable	10923537	2118007	(+)8805530	2111000	3972000	(-)1861000	13034537	6090007	(+)6944530
Unclassified	-	-	-	2827143	-	(+)2827143	2827143	-	(+)2827143

figures rounded off.

and 8.63 million tonnes resources increased in Chatarpur, Jhabua and Sagar districts of Madhya Pradesh due to reassessment of resources in the existing deposits, and addition of two new deposits with total resources of 4.73 million tonnes.

A total 46 deposits have been covered in the inventory as on 1.4.2015 of which 31 deposits are in freehold, 13 deposits are in leasehold public and two deposits in leasehold private.

Table – 2 : Total Resources of Phosphate (Phosphorite) as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In tonne)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	**312678615**	**296284351**	**(+)16394264**
Gujarat	314820	314820	No Change
Jharkhand	107370000	107370000	No Change
Madhya Pradesh	58050825	49417740	(+)8633085
Meghalaya	1311035	1311035	No Change
Rajasthan	95680106	87918926	(+)7761180
Uttarakhand	24178386	24178386	No Change
Uttar Pradesh	25773444	25773444	No Change

figures rounded off.

Table - 3 : District wise Reserves/Resources of Phosphate (Phosphorite) as on 1.4.2015

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	**45807485**	**266871130**	**312678615**
Gujarat	**-**	**314820**	**314820**
Panchmahals	-	314820	314820
Jharkhand	**-**	**107370000**	**107370000**
Garwah	-	107370000	107370000
Madhya Pradesh	**7496948**	**50553877**	**58050825**
Chhatarpur	2204764	15638283	17843047
Jhabua	4694769	33577961	38272730
Khargon(West Nimar)	-	50625	50625
Sagar	597415	1287008	1884423
Meghalaya	**-**	**1311035**	**1311035**
Garo Hills (East)	-	111035	111035
Jaintia Hills	-	1200000	1200000
Rajasthan	**38310537**	**57369569**	**95680106**
Alwar	-	6400000	6400000
Banswara	-	63550	63550
Jaipur	-	67250	67250
Jaisalmer	-	8738150	8738150
Udaipur	38310537	42100619	80411156
Uttarakhand	**-**	**24178386**	**24178386**
Dehradun	-	24178373	24178373
Tehri Garhwal	-	13	13
Uttar Pradesh	**-**	**25773444**	**25773444**
Lalitpur	-	25773444	25773444

figures rounded off.

6.3 POTASH

Introduction

Potash is an essential nutrient for protein synthesis and help plants to use water more efficiently. There are no commercially exploitable resources of potash in the country and the entire requirements of potash for direct application as well as for production of complex fertilizers are met through imports. Bedded marine evaporite deposits and surface and sub-surface potash-rich brines are the principal source of potash. The principal ore is sylvinite, a mixture of sylvite (KCl) and rock salt (NaCl).

Basis of Grade Classification

The potash resources in the NMI as on 1.4.2015 have been classified in the following four grades:

1.	Glauconite	As occurring in parts of Madhya Pradesh and Uttar Pradesh
2.	Polyhalite	As occurring in Ganganagar basin of Rajasthan
3.	Sylvite	As occurring in Ganganagar basin of Rajasthan
4.	Unclassified	Those types which cannot fit into above types.

Sylvite and evaporites are reported in terms of potassium (K), glauconite is reported in terms of K_2O.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to norms of this system, the entire estimation of potash has been placed under remaining resources in indicated (332), inferred (333) and reconnaissance (334) categories.

Salient Features of the Inventory

The total resources of potash in the country as on 1.4.2015 are in the freehold deposit and have been estimated at 22,508 million tonnes under remaining resources category. The total quantity of remaining resources has increased by 693 million tonnes (3%) as on 01.04.2015 with respect to 01.04.2010.The entire increase of 693 million tonnes of Potash resources are due to addition of 3 new deposits (2 in Sonbhadra and 1 in Chitrakut district) in Uttar Pradesh.

All India scenario of potash mineral resources as on 1.4.2015 vis-a-vis 1.4.2010 has been given in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase or decrease of resources as per lease status, grade and states. In Table-3 district wise reserves/resources as on 1.4.2015 has been given.

Major part of these resources (91%) are located in Nagaur district of Rajasthan, followed by Panna district, Madhya Pradesh (5%) and the balance in Sonbhadra & Chitrakut district, Uttar Pradesh (4%). Occurrences of Potash are also reported from Tirap districts of Arunachal Pradesh, Rohtas district of Bihar, Kutch district of Gujarat, Rohtak and Sirsa districts of Haryana, Leh district of Jammu & Kashmir, Sidhi district of Madhya Pradesh, Bhatinda district of Punjab, Bhilwara and Nagaur district of Rajasthan, Tanjavur district of Tamil Nadu, Banda, Chitrakut, Sonbhadra and Etah districts of Uttar Pradesh.

Of the total resources as on 1.4.2015, polyhalite grade constitutes 16,164 million tonnes (72%), Sylvite grade 2,477 million tonnes (11%), Glauconite grade 2,662 million tonnes (12%) and unclassified resources 1,206 million tonnes (5%).

The entire estimation of resources of potash in Madhya Pradesh, Uttar Pradesh and Rajasthan are based on the exploration work done by GSI. Occurrences of Potash in Madhya Pradesh and Uttar Pradesh are of Glauconite type.

The feasibility of economic exploitation of entire resources reported in NMI have not yet been established, therefore, the resources have been placed under UNFC codes (332), (333) and (334) categories. Out of total 22,508 million tonnes of resources, about 4,367 million tonnes have been estimated under inferred and reconaissance categories.

Table - 1 : Reserves/Resources of Potash as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In million tonnes)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total	**-**	**-**	**-**	**22508**	**21815**	**(+)693**	**22508**	**21815**	**(+)693**
Freehold									
Glaluconite	-	-	-	2662	1968	(+) 693	2662	1968	(+) 693
Polyhalite	-	-	-	16164	16164	No Change	16164	16164	No Change
Sylvite	-	-	-	2477	2477	No Change	2477	2477	No Change
Unclassified	-	-	-	1206	1206	No Change	1206	1206	No Change

figures rounded off.

Table – 2 : Total Resources of Potash as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In million tonnes)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	**22508**	**21815**	**(+)693**
Madhya Pradesh	1206	1206	No Change
Rajasthan	20419	20419	No Change
Uttar Pradesh	883	190	(+)693

figures rounded off.

Table - 3 : District wise Reserves/Resources of Potash as on 1.4.2015

(In million tonnes)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	**-**	**22508**	**22508**
Madhya Pradesh	**-**	**1206**	**1206**
Panna	-	1206	1206
Rajasthan	**-**	**20419**	**20419**
Jaisalmer	-	22	22
Nagaur	-	20397	20397
Uttar Pradesh	**-**	**883**	**883**
Chitrakut	-	50	50
Sonbhadra	-	833	833

figures rounded off.

6.4 PYRITE

Introduction

Pyrite is an iron sulphide having chemical formula, FeS_2. It is used for manufacture of sulphuric acid, and as direct feed for soil conditioning. Marcasite and pyrrhotite are the other iron sulphide minerals.

After native sulphur, pyrite is the common source of sulphur. It is a common constituent of many metaliferrous veins but also occurs as disseminated crystals in sedimentary and metamorphosed rocks and coal. 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.

Basis of Grade Classification

The Expert Group on classification of minerals with regard to their possible optimum industrial use (December, 1989) in its report observed that the minimum grade which can be beneficiated for production of sulphuric acid is 22% S. The Pyrite, Phosphate and Chemicals Ltd., was marketing pyrite with an average of 30% S and which was more suitable for direct use as a conditioner for alkaline soil. The basis for resource classification of pyrite adopted in present inventory as on 1.4.2015 is given below :

1.	Soil Reclamation	30-38% S
2.	Beneficiable	22-30% S
3.	Low	(-) 22% S
4.	Unclassified	The range of minimum and maximum values is too wide to fit into any of the above grades.
5.	Not known	Where the relevant data is not available for determination of grade.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system, the entire estimation of pyrite has been placed under 'remaining resources' which has further been classified under feasibility (211), pre-feasibility (222), measured (331), indicated (332) and inferred (333) categories.

Salient Features of the Inventory

All India scenario of pyrite resources as on 1.4.2015 vis-a-vis 1.4.2010 have been given in Tables - 1 and 2. These tables give an idea about the significant changes in terms of increase or decrease of resources as per lease status, grades and states. District wise resources of pyrite as on 1.4.2015 have been given in Table-3.

The total resources of pyrite in the country as on 1.4.2015 have been estimated at 1,674,401 thousand tonnes under remaining resources category. Of the total resources, the share of freehold areas is 60,383 thousand tonnes (3.6%) and the balance 1614,018 thousand tonnes (96.4%) is under leasehold public sector.

Out of the total resources, soil reclamation grade constitutes 6,024 thousand tonnes (0.4%), beneficiable grade 61,628 thousand tonnes (3.7%), low grade 1,555,330 thousand tonnes (92.9%) and unclassified 51,419 thousand tonnes (3.0%).

Of the total resources, Bihar is credited with 1,574,561 thousand tonnes (94%) followed by Rajasthan 90,876 thousand tonnes (5.4%). The balance 8,964 thousand tonnes (0.6%) resources have been accounted by Karnataka, Himachal Pradesh, West Bengal, Andhra Pradesh and Tamil Nadu.

About 99% of the total resources of pyrite are confined only in two districts viz. Rohtas in Bihar (94%) and Sikar in Rajasthan (5%).

There is no production of pyrite in the country since the last many years, therefore the resources as compared to the inventory as on 1.4.2005 have not changed.

About 1,527,356 thousand tonnes (91%) of the total resources of pyrite have been estimated under inferred category. These resources have been estimated based on a very limited and preliminary exploration. If these

Table - 1 : Reserves/Resources of Pyrite as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In '000 tonnes)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total	**-**	**-**	**-**	**1674401**	**1674401**	**No change**	**1,674,401**	**1,674,401**	**No change**
Soil Reclamation	-	-	-	6024	6024	No change	6024	6024	No change
Beneficiable	-	-	-	61628	61628	No change	61628	61628	No change
Low	-	-	-	1555330	1555330	No change	1555330	1555330	No change
Unclassified	-	-	-	51419	51419	No change	51419	51419	No change
Freehold	**-**	**-**	**-**	**60383**	**60383**	**No change**	**60383**	**60383**	**No change**
Soil Reclamation	-	-	-	3024	3024	No change	3024	3024	No change
Beneficiable	-	-	-	880	880	No change	880	880	No change
Low	-	-	-	5060	5060	No change	5060	5060	No change
Unclassified	-	-	-	51419	51419	No change	51419	51419	No change
Leasehold (Public)	**-**	**-**	**-**	**1614018**	**1614018**	**No change**	**1614018**	**1614018**	**No change**
Soil Reclamation	-	-	-	3000	3000	No change	3000	3000	No change
Beneficiable	-	-	-	60748	60748	No change	60748	60748	No change
Low	-	-	-	1550270	1550270	No change	1550270	1550270	No change

figures rounded off.

areas are examined for further detailed exploration, the confidence level of resources position of pyrite in the country may improve.

In the inventory as on 1.4.2015 only 8 deposits have been reported. Of these, 5 deposits are in freehold areas and the balance 3 deposits in leasehold public sector areas.

Table – 2 : Total Resources of Pyrite as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In '000 tonnes)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	**1674401**	**1674401**	**No Change**
Andhra Pradesh	880	880	No Change
Bihar	1574561	1574561	No Change
Himachal Pradesh	2560	2560	No Change
Karnataka	3000	3000	No Change
Rajasthan	90876	90876	No Change
Tamil Nadu	24	24	No Change
West Bengal	2500	2500	No Change

figures rounded off.

Table - 3 : District wise Reserves/Resources of Pyrite as on 1.4.2015

(In '000 tonnes)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	**-**	**1674401**	**1674401**
Andhra Pradesh	**-**	**880**	**880**
Kurnool	-	880	880
Bihar	**-**	**1574561**	**1574561**
Rohtas	-	1574561	1574561
Himachal Pradesh	**-**	**2560**	**2560**
Simla	-	2560	2560
Karnataka	**-**	**3000**	**3000**
Chitradurga	-	3000	3000
Rajasthan	**-**	**90876**	**90876**
Sikar	-	90876	90876
Tamil Nadu	**-**	**24**	**24**
Vellore	-	24	24
West Bengal	**-**	**2500**	**2500**
Purulia	-	2500	2500

figures rounded off.

6.5 SULPHUR (NATIVE)

Introduction

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. Sulphur is used as vulcanising agent, for the production of sulphur dioxide used in paper industry, for refining sugar in sugar industry and in bleaching industry for the manufacture of carbon disulphide which are used for manufacturing rayon. It is also used as a fumigant for stored grain and as a pesticide, etc.

Commercial deposits of native sulphur occur either in salt domes or in bedded deposits associated with gypsum, limestone or as surface deposits associated with some phase of volcanism.

Native sulphur deposit has been reported in Puga Valley of Leh district in 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 Bay of Bengal. Sulphur along with hot springs were reported from various parts of Chamoli, Rudraprayag. Uttarkashi, etc. districts in Garhwal & Kummon 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.

Basis of Grade Classifiction

There are no BIS specifications of sulphur for use in industries. The available resources in the inventory have been classified as 'Sulphur (Native)'.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), the resources are broadly classified into 'reserves' and 'remaining resources'. According to the norms of this system, the entire resources of sulphur have been placed under inferred (333) category of remaining resources.

Salient Features of the Inventory

The total resources of sulphur (native) in the country as on 1.4.2015 have been estimated at 210 thousand tonnes. There are no mineable reserves of elemental sulphur in the country. The entire estimation has been made in freehold areas and has been placed under inferred category of remaining resources.

All India scenario of sulphur reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 have been given in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase or decrease of resources as per lease status, grade, and state. In Table-3, district wise reserves/resources as on 1.4.2015 have been given.

These resources of native sulphur have been estimated from a single deposit in Puga valley of Leh district in Jammu & Kashmir.

There is no change in the inventory as on 1.4.2015 as compared to earlier inventory as on 1.4.2010.

A total 02 freehold deposits of sulphur (Native) have been covered in the National Mineral Inventory as on 1.4.2015. Out of which resources have been estimated in one deposit only.

Table – 2 : Total Resources of Sulphur (Native) as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In '000 tonnes)

State	Total resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India /Jammu & Kashmir	**210**	**210**	**No Change**

figures rounded off.

Table - 1 : Reserves/Resources of Sulphur (Native) as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In '000 tonnes)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India/Freehold	-	-	-	**210**	**210**	**No change**	**210**	**210**	**No change**
Sulphur(Native)	-	-	-	210	210	No change	210	210	No change

figures rounded off.

Table - 3 : District wise Reserves/Resources of Sulphur (Native) as on 1.4.2015

(In '000 tonnes)

State/District	Reserves	Remaining resources	Total resources
All India : Total	-	**210**	**210**
Jammu & Kashmir	-	**210**	**210**
Leh	-	210	210

figures rounded off.