

BARYTES



# Indian Minerals Yearbook 2012

(Part- III : Mineral Reviews)

51<sup>st</sup> Edition

**BARYTES**

(FINAL RELEASE)

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February, 2014

# 3 Barytes

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**B**aryte or barite is the moderately soft crystalline mineral form of barium sulphate. Approximately, 80% barytes produced worldwide is used for oil and gas drilling as weighting agent in drilling mud because of its unique physical and chemical properties like heavyness and high specific gravity and magnetic neutrality. It is also used as a feedstock for production of various barium compounds, and is also utilised as filler, extender and aggregate. Another application after its conversion to barium carbonate is in the manufacture of ceramic and glass. The Mangampet deposit in Cuddapah district of Andhra Pradesh is the single largest barytes deposit in the world. India is one of the leading producers and exporters of barytes in the world.

## RESOURCES

The total resources of barytes in India as on 1.4.2010 as per UNFC system are placed at 73 million tonnes constituting 43% reserves and 57% remaining resources. By grades, 40% resources are of oil-well drilling grade followed by 6% of chemical grade, 1% of paint grade and 33% constitute low grade. About 20% resources are of other, unclassified and not-known categories. Andhra Pradesh alone accounts for 94% of the country's baryte resources (Table - 1).

## PRODUCTION, STOCKS AND PRICES

The production of barytes at 1,723 thousand tonnes in 2011-12 registered a decrease of 26% as compared to that in the previous year. There were seven reporting mines during the year under review as against eight in the preceding year. Andhra Pradesh continued to be the premier state in barytes production and accounted for almost the entire production of barytes. Very nominal production was reported from Rajasthan.

The Andhra Pradesh Mineral Development Corporation (APMDC) Ltd, is the sole producer in public sector, which accounted for 99% of the total production during 2011-12. The remaining 1 percent output of barytes was contributed by 6 private sector mines. Among them contribution of one

mine was only 20 tonnes. The rest was contributed by two mines with an annual production range of 5 thousand to 20 thousand tonnes each and three mines having annual production ranging from 500 tonnes to 5 thousand tonnes each.

Almost the entire production of barytes was of off-colour variety. Only nominal production was reported in snow white variety which was mainly from Udaipur district of Rajasthan and Cuddapah district of Andhra Pradesh (Tables - 2 to 5).

The mine-head stocks of barytes at the end of year 2011-12 was 5,121 thousand tonnes as against 5,181 thousand tonnes in the beginning of the year (Table-6).

The average daily employment of labour in 2011-12 was 484 as against 617 in the previous year. Domestic prices of barytes are furnished in the General Review on 'Prices'.

## MINING, MARKETING AND TRANSPORT

Barytes mines in India are worked by opencast method, except one in Himachal Pradesh and two in Andhra Pradesh. Andhra Pradesh Mineral Development Corp. Ltd, (APMDC), the largest producer, obtains barytes from the mechanised opencast mine in Mangampet area in Cuddapah district, Andhra Pradesh. Drills, loaders, dozers and dumper trucks are used for removing overburden. Barytes is won from benches using jackhammers and then loaded into trucks. The corporation produces ore by engaging a raising contractor and supplies the ore to exporters, Oil and Natral Gas Corporation Ltd., Oil India, Barium Chemical Industries and also to local pulverising industries.

While marketing, barytes is graded into two varieties: off-colour and snow-white. The white and snow-white varieties are used generally as fillers in the manufacture of rubber goods and as an opacifying material in the manufacture of paints and paper. The off-colour barytes is used for manufacturing chemicals or as drilling muds. Both the well-known grades laid down by Oil Companies Material Association (OCMA) and American Petroleum Institute (API) were produced and marketed in the country. The country supplies drilling grade barytes to Middle East and South America.

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

(In tonnes)

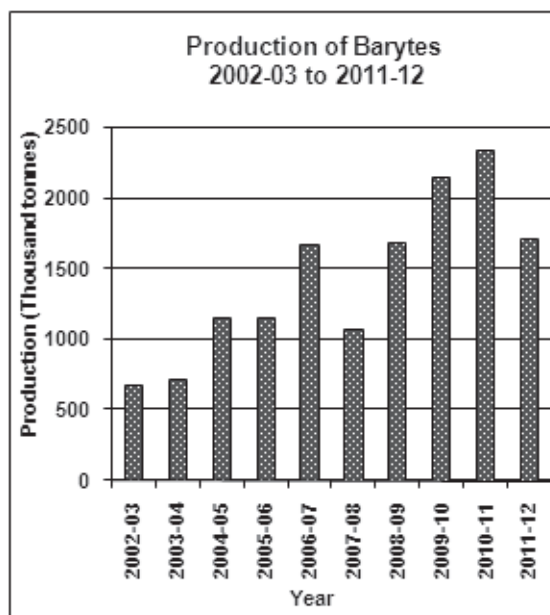
Grade/State	Reserves			Remaining resources						Total resources (A+B)			
	Proved STD111	Probable		Feasibility STD211	Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)				
		STD121	STD122								STD221	STD222	
<b>All India : Total</b>	<b>29557972</b>	<b>90844</b>	<b>1935312</b>	<b>31584128</b>	<b>179447</b>	<b>4288189</b>	<b>2608562</b>	<b>207384</b>	<b>1269214</b>	<b>32491229</b>	<b>105721</b>	<b>41149746</b>	<b>72733874</b>
<b>By Grades</b>													
Chemical-A	91368	41970	133860	267198	1694	21665	20081	-	140553	546843	-	730836	998034
Chemical -B	1469453	17550	603280	2090283	28913	24860	111201	21717	493318	905933	12835	1598777	3689060
Oil well Drilling	20843906	16722	882447	21743075	85522	169400	562294	48550	177407	6295057	-	7338230	29081305
Paint	87795	14602	119669	222066	-	28452	15606	48904	21608	147135	-	261705	483771
Low	5000	-	5285	10285	-	58068	333928	1210	361950	23040953	92886	23888995	23899280
Others	7032150	-	190771	7222921	28206	3985744	1535592	-	-	12599	-	5562141	12785062
Unclassified	28300	-	-	28300	35112	-	29440	83195	69878	1494283	-	1711908	1740208
Not-known	-	-	-	-	-	-	420	3808	4500	48426	-	57154	57154
<b>By States</b>													
Andhra Pradesh	29396236	79736	1845270	31321242	173429	4252061	2500159	105872	387394	29632557	105721	37157193	68478435
Haryana	-	-	-	-	-	-	-	-	-	440	-	440	440
Himachal Pradesh	27288	-	12645	39933	-	12846	-	48904	12370	3000	-	77120	117053
Jharkhand	-	-	-	-	-	-	-	-	-	35900	-	35900	35900
Karnataka	-	-	-	-	-	-	-	-	-	15175	-	15175	15175
Madhya Pradesh	-	-	-	-	-	18500	4472	-	35000	233940	-	291912	291912
Maharashtra	-	-	-	-	-	-	-	14800	89450	18610	-	122860	122860
Rajasthan	134448	11108	77397	222953	6018	4782	103931	37808	311500	2304688	-	2768727	2991680
Tamil Nadu	-	-	-	-	-	-	-	-	500	221919	-	222419	222419
Uttarakhand	-	-	-	-	-	-	-	-	-	25000	-	25000	25000
West Bengal	-	-	-	-	-	-	-	-	433000	-	-	433000	433000

Figures rounded off.

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**Table – 2 : Principal Producers of Barytes  
2011-12**

Name and address of producer	Location of mine	
	State	District
M/s. Andhra Pradesh Mineral Development Corpn. Ltd, HMWS SB, Rear Block, 3rd Floor, Khairatabad, Hyderabad - 500 004, Andhra Pradesh.	Andhra Pradesh	Cuddapah
Rajasthan Barytes Ltd., 3-A, Fatehpura, Sukhadia Circle, Post-Udaipur-313 001. Rajasthan.	Rajasthan	Udaipur



**Table – 3 : Production of Barytes, 2009-10 to 2011-12  
(By States)**

(Qty in tonnes; value in ₹'000)

State	2009-10		2010-11		2011-12(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>2152552</b>	<b>2601842</b>	<b>2338806</b>	<b>2698279</b>	<b>1722804</b>	<b>1651573</b>
Andhra Pradesh	2146460	2599224	2332701	2695846	1714749	1647156
Himachal Pradesh	107	161	-	-	-	-
Rajasthan	5985	2457	6105	2433	8055	4417

**Table – 4 : Production of Barytes, 2010-11 and 2011-12  
(By Sectors/States/Districts/Grades)**

(Qty in tonnes; value in ₹'000)

State/District	2010-11					2011-12(P)				
	Grades			Total		Grades			Total	
	No. of mines	Snow-White	Off-colour	Quantity	Value	No. of mines	Snow-White	Off-colour	Quantity	Value
<b>India</b>	<b>8</b>	<b>4176</b>	<b>2334630</b>	<b>2338806</b>	<b>2698279</b>	<b>7</b>	<b>3601</b>	<b>1719203</b>	<b>1722804</b>	<b>1651573</b>
Public sector	1	-	2289792	2289792	2679057	1	-	1702820	1702820	1642830
Private sector	7	4176	44838	49014	19222	6	3601	16383	19984	8743
<b>Andhra Pradesh</b>	<b>7</b>	<b>3065</b>	<b>2329636</b>	<b>2332701</b>	<b>2695846</b>	<b>6</b>	<b>1990</b>	<b>1712759</b>	<b>1714749</b>	<b>1647156</b>
Cuddapah	6	3065	2319640	2322705	2692847	4	1990	1707060	1709050	1645654
Khammam	1	-	9996	9996	2999	1	-	5679	5679	1498
Prakasham	-	-	-	-	-	1	-	20	20	4
<b>Rajasthan</b>	<b>1</b>	<b>1111</b>	<b>4994</b>	<b>6105</b>	<b>2433</b>	<b>1</b>	<b>1611</b>	<b>6444</b>	<b>8055</b>	<b>4417</b>
Udaipur	1	1111	4994	6105	2433	1	1611	6444	8055	4417

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**Table – 5 : Production of Barytes, 2010-11 and 2011-12(P)  
(By Frequency Groups)**

(Qty in tonnes)

Production Group	No. of mines		Production for the group		Percentage in total production		Cumulative percentage	
	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12
<b>All Groups</b>	<b>8</b>	<b>7</b>	<b>2338806</b>	<b>1722804</b>	<b>100.00</b>	<b>100.00</b>	<b>-</b>	<b>-</b>
Up to 500	2	1	68	20	0.01	0.01	0.01	0.01
501-2000	1	2	1754	3210	0.07	0.18	0.08	0.19
2001-5000	1	1	3236	3020	0.14	0.17	0.22	0.36
5001-20,000	2	2	16101	13734	0.69	0.80	0.91	1.16
Above 20,000	2	1	2317647	1702820	99.09	98.84	100.00	100.00

**Table – 6 : Mine-head Stocks of Barytes, 2011-12(P)  
(By States/Grades)**

(In tonnes)

State	At the beginning of the year			At the end of the year		
	Grades		Total	Grades		Total
	Snow-white	Off-colour		Snow-white	Off-colour	
<b>India</b>	<b>148078</b>	<b>5032577</b>	<b>5180655</b>	<b>753</b>	<b>5120297</b>	<b>5121050</b>
Andhra Pradesh	147995	5031995	5179990	674	5119736	5120410
Himachal Pradesh	-	87	87	-	87	87
Rajasthan	83	495	578	79	474	553

## CONSUMPTION

The reported consumption of barytes decreased to 186 thousand tonnes in 2011-12 from 192 thousand tonnes in 2010-11. The Oil-well drilling Industry, the main consumer of barytes, accounted for

77% consumption, which was followed by Chemical Industry with 18% consumption. Other barytes consuming industries like paint, asbestos products, glass, rubber, paper and cement accounted for the remaining 5% consumption (Table-7).

**Table – 7 : Reported Consumption of Barytes, 2009-10 to 2011-12  
(By Industries)**

(In tonnes)

Industry	2009-10	2010-11(R)	2011-12(P)
<b>All Industries</b>	<b>200500</b>	<b>191900</b>	<b>186300</b>
Asbestos products	1000(1)	1000(1)	1000(1)
Chemical	34300(5)	34300(5)	34300(5)
Glass	600(7)	600(7)	600(8)
Oil-well drilling	143200(2)	149500(2)	143500(2)
Paint	6100(30)	6400(31)	6800(31)
Cement	15200(1)	++(1)	++(1)
Others(Paper & Rubber)	100(3)	100(3)	100(3)

Figures rounded off.

Figures in parentheses denote the number of units in organised sector reporting\* consumption.  
(\*Includes actual reported consumption and/or estimates made wherever required).

## USES AND SPECIFICATIONS

### Oil and Gas Drilling

The properties like insolubility in water, inertness and high specific gravity enable barytes application as a weighting agent in drilling operations to control pressure, prevent blow-out and at the same time to provide lubrication. Barytes powder containing minimum 90% barium sulphate with 4.15 specific gravity is recommended for drilling. For offshore drilling, the specific gravity should be 4.2. At least 97% ground barytes should pass through 75- micron IS sieve and 95% through 53- micron IS sieve.

### Chemical

Major barium chemicals obtained from barytes are carbonate, chloride, oxide, hydroxide, nitrate, peroxide and sulphate. Barium carbonate is used in glass industry, electro-ceramics and for removing inconvenient impurities in phosphoric acid. Barium hydroxide is used in the preparation of barium salts of organic acids which are utilised as additives for lubricating oils and as stabilisers for PVC. Barium sulphate is used as pigment, extender and filler in rubber and paper industries.

Lithopone, a mixture of  $\text{BaSO}_4$  and  $\text{ZnS}$ , is used in paint and lacquer industries as white pigment, extenders and fillers. Barium nitrate is used in green signal flares, tracer bullets, primers and detonators. Barium oxide is used in electric furnace. Barium titanate finds use in miniature electronic and communication equipment. Barytes is also used in explosive manufacture.

For chemical industry, purity is the prime criterion, with ferric oxide and strontium sulphate limited to a maximum 1% and fluorine to traces. The mesh size is also important in manufacturing chemicals. Barytes used in explosive manufacture may be bleached or unbleached. It should be in dry powder form free from extraneous matter.

### Paint

Barytes is used as filler and extender in paint industry. White pigment is manufactured from barytes. Barytes should be free from mud, clay or siliceous minerals. Presence of iron oxide is undesirable. The material should be in the form of dry powder.

### Glass

In glass manufacturing, barytes is added to the glass melt for making the glass more workable and enhancing its brilliance. Iron is the most undesirable impurity.

### Rubber

Barytes is used as a filler and extender in rubber products. It is added to rubber compounds for reinforcement. Barytes containing minimum 99.5%  $\text{BaSO}_4$  is usually preferred. Since such purity material is not found in nature, before use, barytes is normally bleached called 'blanc fixe'. The sieve residue through 75-micron and 150- micron sieve should be 4% and 0.01% max., respectively. BIS has prescribed IS:1683-1994 (Reaffirmed 2008) as specification of barytes for use in rubber industry.

### Other Uses

Barytes is used in the manufacture of asbestos products required for autobrake lining and other frictional materials. It is used as a filler in paper industry. Finely ground barytes and clay are used as suspension in Barvois system of coal washing. Barytes is also used in concrete aggregate required for reactor shielding. In medicine it is used in radiodiagnosis to highlight the abnormalisation of internal body parts. Barytes also finds use in explosives and pyrotechnics composition for which BIS has laid down specifications vide IS 7588-1992 (Reaffirmed 2011).

The specifications of barytes for various industries are given in Table - 8.

## SUBSTITUTES AND TECHNICAL POSSIBILITIES

Drilling mud substitutes include celestite, iron ore, synthetic hematite and ilmenite but the low cost and technical advantages of barytes deter substitution. Iron ore fines and ilmenite are substitutes used for deep drilling. Reclamation and recycling of drilling muds have been increasingly hampering the requirement for new supplies. Further new oil exploration techniques and drilling methods have reduced the need for new boreholes and wells, which have led to curtailment in the requirement for drilling muds. As a filler, barytes can be substituted by diatomite, felspar, kaolin, mica, talc and silica flour.

**Table – 8 : Specifications of Barytes in different Industries**

Industry	IS Specifications/ of other organisation	Chemical constituent					Physical characteristic					Remarks			
		BaSO <sub>4</sub>	SiO <sub>2</sub>	Ca & Mg as CaCO <sub>3</sub>	BaCO <sub>3</sub>	Alumi- nium as Al	Iron as Fe	Fineness	Relative density	Colour	Volatile matter		Residue on sieve	Oil absorption	pH
1. Oil-well drilling	IS : 2881-1984, 90% min (Second Revision, Reaffirmed 2003) Grade-2	-	-	-	-	-	-	4.15 at 27 °C	Off- colour	-	-	-	-	-	For offshore drilling, relative density shall be 4.20.
2. Chemical	IS : 2881-1984, (Second Revision, Reaffirmed 2003) Grade-1	Quality 'A' 97% min	2% max	0.1% max	-	0.1% max	0.1% max	-	-	-	-	-	-	-	-
		Quality 'B' 90% min	-	2% max	-	-	1.5% max	4.0 min	-	-	-	-	-	-	Silica and aluminium oxide together shall be 6% max.
3. Paint	IS : 64-1972, (First Revision, Reaffirmed 2004) Type - I (Natural barytes) Grade - I	95% min	-	-	2.24% max	-	-	4.45 at 25 °C	Snow- white to white.	0.5% to max	0.25% on 40-micron IS sieve (400 mesh)	6 to 12	6 to 8	Matter soluble in water should not be more than 0.5%.	
	Grade-II	95% min	-	-	2.24% max	-	-	4.45% at 25 °C	-do-	0.5% max.	0.25% on 63-micron IS-Sieve (240 mesh)	6 to 12	6 to 8	Matter soluble in water should not be more than 0.5%.	
	Type-II (Precipitated barytes)	97% min	-	-	0.45% max	-	-	3.36 at 25 °C	A close match to that of ap- proved sample	0.5% max	0.1% on 40-micron IS- sieve (400 mesh)	15 to 30	6 to 8	Matter soluble in water should not be more than 0.5%.	
4. Glass	Based on user's demand	90 to 98% (preferably 96%)	1.5% max	-	-	0.15% max as Al <sub>2</sub> O <sub>3</sub>	0.3 to 0.5% max (pre- ferably 0.1% Fe <sub>2</sub> O <sub>3</sub> )	-	-	-	-	-	-	-	Iron is the most undesirable impurity; white colour or light shades are preferred.

Note: BIS has prescribed IS: 1683-1994 for specifications of barytes used in rubber industry and IS:7588-1992 for that used in explosive industry.

## BARYTES

### TRADE POLICY

As per Foreign Trade Policy (FTP) 2009-14, in force, import and export of barytes (both lumps and powder) as also witherite (natural barium carbonate) are allowed without restrictions under heading No. 2511.

### WORLD REVIEW

The world reserves of barytes are assessed at 240 million tonnes. China, India, USA, Algeria, Morocco, Mexico and Turkey accounted for 82% world reserve (Table-9).

The world production of barytes is same at 9 million tonnes in 2011 and in 2010. The leading producers were China (48%), India (19%), Morocco (9%) and USA (7%). The countrywise production of barytes is given in Table - 10.

**Table – 9 : World Reserves of Barytes  
(By Principal Countries)**

(In '000 tonnes)	
Country	Reserves
<b>World : Total (rounded)</b>	<b>240000</b>
Algeria	29000
China	100000
Germany	1000
India	32000
Iran	NA
Kazakhstan	NA
Mexico	7000
Morocco	10000
Pakistan	1000
Russia	12000
Turkey	4000
UK	100
USA	15000
Other countries	24000

*Source : Mineral Commodity Summaries, 2013.*

**Table – 10 : World Production of Barytes  
(By Principal Countries)**

(In '000 tonnes)			
Country	2009	2010	2011
<b>World : Total</b>	<b>7500</b>	<b>9000</b>	<b>9000</b>
Algeria	38	42	40 <sup>e</sup>
Brazil	39	40 <sup>e</sup>	40 <sup>e</sup>
Bulgaria	14	0.50	0.20
China	2900	3900	4300
Germany	46	56	55
India	2153	2334	1716
Iran	361	326	330 <sup>e</sup>
Kazakhstan	170	200	200
Mexico	153	143	135
Morocco	587	572	770
Peru	28	52	87
Pakistan	63	57	32
Russia <sup>a</sup>	64	64	64
Thailand	52	33	68
Turkey	213	225	225
UK	36	34	31
USA	383	662	640
Vietnam	70	90	90
Other countries	130	169.5	176.8

*Source : World Mineral Production, 2007-2011.*

### FOREIGN TRADE

#### Exports

Exports of barytes increased to 10.36 lakh tonnes in 2011-12 from 8.66 lakh tonnes in the previous year. Exports were mainly to USA (30%) Kuwait (19%), Saudi Arabia (13%) (Tables - 11 and 12).

**Table – 11 : Exports of Baryte  
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>866236</b>	<b>3146360</b>	<b>1036798</b>	<b>5406455</b>
USA	45500	143325	312918	1533973
Kuwait	94090	310099	198167	792753
Saudi Arabia	251202	801387	129698	702412
Venezuela	58268	308838	68557	502080
Columbia	60740	199811	38500	189408
Thailand	-	-	21952	159611
Malaysia	11021	42663	25176	156235
UAE	81321	260635	35036	141718
Brunei	1086	5063	23503	134586
Iraq	5766	26420	22067	134274
Other countries	257242	1048119	161224	959405



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**Table – 12 : Exports of Witherite  
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	17	351	++	14
Thailand	-	-	++	8
Japan	-	-	++	4
Sri Lanka	-	-	++	2
Other countries	17	351	-	-

**Imports**

In 2011-12, imports of barytes were at 3,720 tonnes as compared to 2,843 tonnes in the previous year. Imports were mainly from China UK and USA (Tables - 13 and 14).

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

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>2843</b>	<b>37498</b>	<b>3720</b>	<b>656032</b>
USA	3	93	635	609390
China	1587	19000	2204	27370
UK	374	6846	692	11481
Germany	22	4279	45	4875
Thailand	631	5231	109	2023
Japan	++	8	22	482
Unspecified	-	-	6	147
Rep. of Korea	6	122	4	91
Malaysia	-	-	2	71
Spain	-	-	1	59
Other countries	220	1919	++	43

**Table – 14 : Imports of Witherite  
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>3</b>	<b>52</b>	<b>78</b>	<b>1994</b>
China	1	9	78	1994
Other countries	2	43	-	-

**FUTURE OUTLOOK**

India ranks second in the production of barytes in the world after China and is one of the important exporters in the world market. The world wide demand for barytes would continue till petroleum products are preferred as chief source of energy. In the domestic front, however, exploration is necessary to locate new deposits of barytes especially in Rajasthan, Himachal Pradesh, etc. The apparent domestic demand of barytes is estimated to be 2.09 million tonnes by 2016-17 and is expected to grow at 9% growth rate. About 80% of the world's barytes is used in the petroleum industry.