

VERMICULITE



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VERMICULITE

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

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Vermiculite is a term applied commercially to micaceous minerals (essentially hydrated silicates of Al, Mg and Fe), usually alteration products of biotite or phlogopite micas formed by the removal of much alkalies and addition of water. Vermiculite differs from mica in its characteristic property, i.e., exfoliation. Crude vermiculite is always exfoliated before use.

RESOURCES

The total resources of vermiculite as on 1.4.2010 as per UNFC system are placed at 2.5 million tonnes of which more than 68% are placed under reserves category. Resources are located in Tamil Nadu (75%), Andhra Pradesh (14%), Karnataka (8%), Rajasthan (2%) and Jharkhand (1%). Minor resources are located in Gujarat, Madhya Pradesh and West Bengal (Table-1).

PRODUCTION, STOCKS & PRICES

Production of vermiculite at 9,746 tonnes in 2011-12 decreased by 49 % as compared to that in the

previous year due to less demand. There were 5 reporting mines during both the years. Besides, production of vermiculite was reported as associated mineral by two mines in 2011-12 as against one mine in previous year. One producer from Tamil Nadu and three from Andhra Pradesh reported 94% of the total output in 2011-12. About 15% of the total production was reported as an associated mineral by an apatite mine and a mica mine located in Andhra Pradesh. The share of public sector was 15% as compared to 11% in the preceding year.

Andhra Pradesh was the leading producing state of vermiculite in 2011-12 which accounted for 85% of the total output and remaining 15% was from Tamil Nadu (Tables - 2 to 4).

Mine-head stocks at the end of 2011-12 were 12,158 tonnes as against 8,397 tonnes in the beginning of the year (Table - 5).

The average daily employment of labour during the year was 127 as against 75 in the preceding year. Domestic prices of vermiculite are furnished in the General Review on 'Prices'.

Table – 2 : Principal Producers of Vermiculite, 2011-12

Name & address of producer	Location of mine	
	State	District
Dugar Insulation India (P) Ltd, Dugar House, 8/85 Raja Street, P. O. Gudur-524 101, Dist. Nellore, Andhra Pradesh.	Andhra Pradesh	Nellore
Tamil Nadu Minerals Ltd, 31, Kamrajar Salai, "TWAD" House, Chepauk, Chennai-600 005, Tamil Nadu.	Tamil Nadu	Vellore
Rama Maruthi Vermiculite Mines, Plot No.1 & 2, Industrial Estate, P.O-Gudur-524 102, Dist-Nellore, Andhra Pradesh.	Andhra Pradesh	Nellore
S.V.Mahendra Reddy, * Hanuman Mica Mine, Inukurthy, Tehsil-Podalukar, Dist-Nellore, Andhra Pradesh.	Andhra Pradesh	Nellore

* Associated mine with mica.

Table-1: Reserves/Resources of Vermiculite as on 1.4.2010
(By Grades/States)

(In tonnes)

Grade/State	Reserves				Remaining resources				Total resources (A+B)				
	Proved STD111	Probable STD121	STD122	Total (A)	Feasibility STD211	Pre-feasibility STD221	STD222	Measured STD331		Indicated STD332	Inferred STD333	Reconnaissance STD334	Total (B)
All India: Total	1628475	24593	50939	1704007	22733	75790	71744	35195	24930	569012	3600	803004	2507011
By Grades													
Refractory	32217	-	14238	46455	-	-	-	-	-	807	-	807	47262
Unclassified	1596258	24593	36701	1657552	22733	75790	71744	35195	24930	568205	3600	802197	2459749
By States													
Andhra Pradesh	102058	24593	50939	177590	1912	3981	2750	35195	9878	119270	3600	176586	354176
Gujarat	-	-	-	-	-	-	-	-	-	1960	-	1960	1960
Jharkhand	-	-	-	-	-	-	-	-	-	30048	-	30048	30048
Karnataka	-	-	-	-	-	69050	64500	-	1562	66658	-	201770	201770
Madhya Pradesh	-	-	-	-	197	-	66	-	-	66	-	329	329
Rajasthan	-	-	-	-	20623	2759	4428	-	13000	2883	-	43693	43693
Tamil Nadu	1526417	-	-	1526417	-	-	-	-	-	343051	-	343051	1869468
West Bengal	-	-	-	-	-	-	-	-	490	5076	-	5566	5566

Figures rounded off.

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

(Qty in tonnes; value in ₹'000)

State	2009-10		2010-11		2011-11(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	11662	7653	19234	13132	9746	6690
Andhra Pradesh	10060	4095	17081	8314	8239	3665
Tamil Nadu	1602	3558	2153	4818	1507	3025

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

(Qty in tonnes; value in ₹'000)

State/District	No. of mines	2010-11		No. of mines	2011-12 (P)	
		Quantity	Value		Quantity	Value
India	5(1)	19234	13132	5(2)	9746	6690
Public sector	1	2153	4818	1	1507	3025
Private sector	4(1)	17081	8314	4(2)	8239	3665
Andhra Pradesh	4(1)	17081	8314	4(2)	8239	3665
Nellore	3	16650	7767	4(1)	7681	3200
Visakhapatnam	1(1)	431	547	(1)	558	465
Tamil Nadu	1	2153	4818	1	1507	3025
Vellore	1	2153	4818	1	1507	3025

Figures in parentheses indicate the number of associated mines.

**Table – 5 : Mine-head Stock of Vermiculite, 2011-12(P)
(By States)**

(Qty in tonnes)

State	At the beginning of the year	At the beginning of the year
India	8397	12158
Andhra Pradesh	3406	7084
Tamil Nadu	4991	5074

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USES

Vermiculite is known for its horticultural applications. It is a common component in potting soils. Unfoliated (unexpanded) vermiculite has only minor uses, such as for circulation in drilling muds and in the annealing of steel. In order to convert raw vermiculite into a product suitable for industrial use, it must be exfoliated or expanded by heating, a process termed 'exfoliation'. When heated rapidly to above 870°C, it expands readily (at right angles to the laminae) to a lightweight material by 6 to 20 times the original volume of raw material but weigh as little as 6-8 lb. per cu ft. The loose bulk density of exfoliated vermiculite is in the range of 52 to 192 kg/m³ depending upon the grade and quality of the raw material. This expansion is because of mechanical separation of the layers when the contained water is converted into steam. Vermiculite is chemically inert, fireproof, non-conductor of electricity and a good insulator against cold and heat (both radiant and conducted), and sound. Unlike cork and other organic lightweight insulating material, it does not rot, is not attacked by vermin and has a fair mechanical strength. It is therefore used as a component of the interior fill for fireproof pillows along with graphite and also used to permit slow cooling of hot pieces in glass blowing, lamp work, steel work and glass bead making.

It is also used as a carrier in fertilizers, herbicides and insecticides. Cementing mixtures of exfoliated vermiculite and binding agents, such as gypsum and plaster, have been important products and are applied to structural steel members in commercial buildings.

The mineral is used in various types of building boards. Fine-sized, untreated vermiculite concentrates are included in the preparation of fireproof plaster boards. The exfoliated product forms the basis of some lightweight plasterboard, whilst ground, exfoliated vermiculite is used in various refractory board products.

The principal uses of expanded vermiculite are based on its thermal insulating quality (due to presence of innumerable air cells), low-density,

fireproof nature and granular form. Larger vermiculite granules are used as a loose fill for thermal insulation for homes, industrial structures, cold storage, refrigeration and high temperature and low temperature industrial equipment. The medium size granules are graded to make insulating lightweight concrete, acoustic and thermal insulating plasters due to fireproof and non-moisture condensing properties, and as soil conditioner to lighten clay soil and to improve the moisture retention qualities of sandy soil. Refractory insulation, both in the form of loose fill and vermiculite bricks, is used in furnaces and kilns up to 1100°C. Minor uses are in paints, lubricants, as a packing material, as filler in plastics and in wallpaper manufacture. Finer granules are used as carriers for agricultural chemicals and as an anticaking agent in fertilizer. Another use of vermiculite is to build fireproof walls in deep mines.

The high absorbency and chemical inertness of exfoliated vermiculite has made it suitable for a wide range of absorbent packing materials as well as for packaged units for the containment of oil and similar liquids. Possible future applications include the detoxification of water and soil, nuclear waste containment and removal, a substrate for fungi cultivation and in incubation of eggs.

SUBSTITUTES

Expanded perlite is a substitute for vermiculite in lightweight concrete and plaster. Other more dense but less costly material substitutes in these applications are expanded clay, shale, slag and slate. In agriculture, substitutes include peat, perlite, sawdust, bark and other plant materials and synthetic soil conditioners.

CONSUMPTION

In 2011-12, the reported consumption of vermiculite was estimated at 800 tonnes. The asbestos-product and refractory industries were the main consumers of vermiculite (Table - 6).

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POLICY

Imports of vermiculite (unexpanded) are allowed freely under Exim Code 25301010, as also those of vermiculite insulation bricks under Exim Code 69029030 as per the Export-Import Policy, 2009-2014 and the Foreign Trade Policy thereunder.

Table - 6: Reported Consumption of Vermiculite 2009-10 to 2011-12 (By Industries)

(In tonnes)			
Industry	2009-10	2010-11(R)	2011-12(P)
All Industries	800	900	800
Asbestos products	700 (1)	700 (1)	700 (1)
Refractory	100 (4)	200 (5)	100 (5)

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).*

WORLD REVIEW

Authentic data on world reserves is not available. Reserves to the tune of 63.50 million tonnes are reported from USA, South Africa, Brazil and other countries. Reserves of other producing countries such as China, Russia, Uganda, Australia, etc. are not available. In 2011, the total estimated production of vermiculite was 508 thousand tonnes in respect of 9 countries for which data was available. South Africa, China and USA were the major producing countries (Tables - 7 and 8).

The Palabora Mining Co. a member of Rio Tinto plc. accounts for about 38% of world's average production and is the largest supplier of vermiculite with reserves in South Africa. Imerys was the second largest supplier of vermiculite. It has production facilities in Alice Springs, Northern Territory, Australia; Korla, China; and Shawa, Zimbabwe.

Brazil

In 2011, Brazil Minerios Ltda produced 50,000 tonnes of vermiculite at its SaO Luis De Montes Belos Mine near Goiania in Central Brazil. Brazil Minerios planned to increase production capacity to 80,000 tonnes by 2013.

Uganda

Gulf Industries Ltd (Sidney, Australia) continued development and production at the East African Namckara vermiculite deposit. East African Vermiculite project (EAVP) in eastern Uganda is considered to be one of the largest deposits.

Table - 7: World Reserves of Vermiculite (By Principal Countries)

(In '000 tonnes)	
Country	Reserve
World: Total	NA
Australia	NA
Brazil	9500
China	NA
Russia	NA
South Africa	14000
USA ^(e)	25000
Uganda	NA
Other countries	15000

Source: Mineral Commodity Summaries, 2013.

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

Country	(In '000 tonnes)		
	2009	2010	2011
Australia	7	8	10 ^(e)
Brazil	50	50	50 ^(e)
China ^(e)	120	120	130
India	12	22	11
Japan ^(e)	6	6	6
Russia ^(e)	30	30	30
South Africa	193	199	171
USA ^{(e)#}	110	100	100
Zimbabwe	3	-	-

*Source : World Mineral Production, 2007-2011.
Sold or used by producers.*

FOREIGN TRADE

Exports

Exports of vermiculite were decreased slightly to 1,139 tonnes in 2011-12 compared to 1,497 tonnes in 2010-11. Exports were mainly to UAE, Japan, Spain and Norway (Table- 9).

Imports

Imports of vermiculite decreased to 222 tonnes in 2011-12 from 312 tonnes in 2010-11. Imports were mainly from South Africa (Table - 10).

**Table – 9: Exports of Vermiculite
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1497	10882	1139	10019
Spain	100	782	219	2309
UAE	307	1984	293	1947
Japan	325	2634	223	1887
Belgium	153	1302	73	951
Norway	141	613	118	535
Ireland	24	247	48	490
Singapore	25	287	27	385
Malaysia	10	105	24	311
UK	-	-	22	261
Australia	-	-	22	245
Other countries	412	2928	70	698

**Table – 10 : Imports of Vermiculite
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	312	7519	222	8227
South Africa	240	4347	124	3330
Saudi Arabia	++	5	2	1342
Brazil	-	-	42	923
China	-	-	11	806
Japan	19	1526	21	801
USA	53	1641	18	679
Korea Rep. of	-	-	2	212
Hong Kong	-	-	1	109
Spain	-	-	1	20
Czech Republic	-	-	++	5