

78 Vermiculite

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 alkalis 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 1.4.2005 as per UNFC system are placed at 2.44 million tonnes of which more than 72% are placed under reserves category. Resources are located in Tamil Nadu (77%), Madhya Pradesh (11%), Andhra Pradesh (5%), Karnataka (4%), Rajasthan (2%) and Jharkhand (1%). Minor resources are located in West Bengal and Gujarat (Table-1).

PRODUCTION, STOCKS & PRICES

Production of vermiculite at 12,847 tonnes in 2009-10 increased by 2% as compared to that

in the previous year. There were 4 reporting mines during the year. Besides, vermiculite production was reported as associated mineral by two mines in both the years. One principal producer from Tamil Nadu and three from Andhra Pradesh recorded 95% of the total output in 2009-10. The remaining production of 5% was reported as associated mineral. The share of public sector was 12% as compared to 15% in the preceding year.

Andhra Pradesh was the leading producer of vermiculite in 2009-10 accounted for 88% of the total output and remaining 12% was from Tamil Nadu (Tables - 2 to 4).

Mine-head stocks at the end of 2009-10 were 6,857 tonnes as against 9,236 tonnes at the beginning of the year (Table - 5).

The average daily employment of labour during the year was 90 as against 42 in the preceding year. Domestic prices of vermiculite are furnished in the General Review on 'Prices'.

**Table – 1 : Reserves/Resources of Vermiculite as on 1.4.2005
(By States)**

(In tonnes)

State	Reserves			Remaining resources				Total resources (A+B)		
	Proved STD111	Probable		Total (A)	Feasibility STD211	Measured STD331	Indicated STD332		Inferred STD333	Total (B)
		STD121	STD122							
All India : Total	1556664	86930	120036	1763630	2773	765	21153	649940	674631	2438261
By States										
Andhra Pradesh	1508	3160	5646	10314	–	765	6101	93304	100170	110484
Gujarat	–	–	–	–	–	–	–	1960	1960	1960
Jharkhand	–	–	–	–	–	–	–	30048	30048	30048
Karnataka	–	17350	10330	27680	–	–	1562	66658	68220	95900
Madhya Pradesh	–	66420	99632	166052	–	–	–	106960	106960	273012
Rajasthan	20623	–	4428	25051	2773	–	13000	2883	18656	43707
Tamil Nadu	1534533	–	–	1534533	–	–	–	343051	343051	1877584
West Bengal	–	–	–	–	–	–	490	5076	5566	5566

Figures rounded off.

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Table – 2 : Principal Producers of Vermiculite, 2009-10

Name & address of producer	Location of mine	
	State	District
Dugar Insulation India (P) Ltd, Dugar House, Raja Street, P. O. Gudur-524 102, Dist. Nellore, Andhra Pradesh.	Andhra Pradesh	Nellore
Sri Ram Murty Pattabhi Ramaiah Bldg., P O. Gudur-524 102, Dist. Nellore, Andhra Pradesh.	Andhra Pradesh	Nellore
* Andhra Phosphate (P) Ltd, 45-58-17/5, Narsimha Nagar, Visakhapatnam-530 024, Andhra Pradesh.	Andhra Pradesh	Visakhapatnam
Tamil Nadu Minerals Ltd, 31, Kamrajar Salai, “TWAD” House, Chepauk, Chennai-600 005, Tamil Nadu.	Tamil Nadu	Vellore

* Associated mine with apatite.

Table – 3 : Production of Vermiculite, 2007-08 to 2009-10

(By States)

(Qty. in tonnes; value in Rs. '000)

State	2007-08		2008-09		2009-10(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	8910	7340	12647	9423	12847	10398
Andhra Pradesh	7224	2822	10726	4275	11245	6105
Tamil Nadu	1686	4518	1921	5148	1602	4293

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**Table – 4 : Production of Vermiculite, 2008-09 and 2009-10
(By Sectors/States/Districts)**

(Qty. in tonnes; value in Rs. '000)

State/District	2008-09			2009-10 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	4(2)	12647	9423	4(2)	12847	10398
Public sector	1	1921	5148	1	1602	4293
Private sector	3(2)	10726	4275	3(2)	11245	6105
Andhra Pradesh	3(2)	10726	4275	3(2)	11245	6105
Nellore	2(1)	9866	3240	3(1)	9617	4071
Visakhapatnam	1(1)	860	1035	(1)	1628	2034
Tamil Nadu	1	1921	5148	1	1602	4293
Vellore	1	1921	5148	1	1602	4293

Figures in parentheses indicate the number of associated mines.

**Table – 5 : Mine-head Stocks of Vermiculite, 2009-10(P)
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
India	9236	6857
Andhra Pradesh	4445	2044
Tamil Nadu	4791	4813

USES

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.

Vermiculite is known for its horticultural applications. It is a common component in potting soils. 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.

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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, and industrial spill containment and clean-up.

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 2009-10, the reported consumption of vermiculite was estimated at 1,300 tonnes. The refractory and asbestos-product industries were the main consumers of vermiculite (Table - 6).

**Table – 6 : Reported Consumption of Vermiculite
2007-08 to 2009-10
(By Industries)**

(In tonnes)

Industry	2007-08	2008-09(R)	2009-10(P)
All Industries	1300	1300	1300
Asbestos products	700 (1)	700 (1)	700 (1)
Refractory	600 (7)	600 (7)	600 (7)

Figures rounded off. Data collected on non-statutory basis.

Figures in parentheses denote the number of units in organised sector reporting consumption.*

(Includes actual reported consumption and/or estimates made wherever required).*

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.

WORLD REVIEW

Reserves of 39 million tonnes are reported from USA and South Africa. Reserves of other producing countries such as China, Russia, Brazil, Zimbabwe, Australia etc. are not available. In 2009, the total estimated production of vermiculite was 509 thousand tonnes in respect of 8 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.

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

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

Source: Mineral Commodity Summaries, 2010.

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

(In '000 tonnes)			
Country	2007	2008	2009
Australia	9	8	7
Brazil ^(e)	19	49	30
China ^(e)	110	120	130
Japan ^(e)	6	6	6
Russia ^(e)	30	30	30
South Africa	200	200	193
USA ^{(e) @}	100	100	110
Zimbabwe	17	16	3

Source : World Mineral Production, 2005-2009.

@ Sold or used by producers.

FOREIGN TRADE

Exports

Exports of vermiculite were 1,015 tonnes in 2009-10 compared to 1,118 tonnes in 2008-09. Exports were mainly to Japan, Norway and UAE (Table - 9).

Imports

Imports of vermiculite decreased to 84 tonnes in 2009-10 from 305 tonnes in 2008-09. Imports were mainly from South Africa (Table - 10).

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

Country	2008-09		2009-10	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	1118	7861	1015	6398
Japan	617	4431	356	2640
UAE	181	1471	182	1135
Israel	–	–	93	611
Norway	234	1324	119	600
Turkey	–	–	66	442
Nepal	40	8	101	375
U S A	3	34	30	223
Chinese Taipei/Taiwan	28	355	22	144
Italy	11	209	–	–
Unspecified	–	–	24	117
Other countries	4	29	22	111

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

Country	2008-09		2009-10	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	305	13072	84	1906
Japan	9	856	19	844
South Africa	–	–	40	642
UK	7	370	5	193
China	–	–	18	126
USA	3	241	2	101
Australia	286	11562	–	–
Unspecified	++	43	–	–