

# 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 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 1.4.2005 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 10,801 tonnes in 2007-08 decreased by 9% compared to that in the previous year due to low market demand. There were 4 reporting mines during the year. One principal producer from Tamil Nadu and three from Andhra Pradesh recorded 91% of the total output in 2007-08. The remaining production of 9% reported as associated mineral. The share of public sector was 16% as compared to 13% in the preceding year.

Andhra Pradesh was the leading producer of vermiculite in 2007-08 and accounted for 84% of the total output and remaining 16% from Tamil Nadu (Tables - 2 to 4).

Mine-head stocks at the end of 2007-08 were 6,941 tonnes as against 6,321 tonnes at the beginning of the year (Table - 5).

The average daily employment of labour during the year was 94 as against 112 in the preceding year. Domestic prices of vermiculite are furnished in Table - 6.

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

(In tonnes)

State	Reserves			Total (A)	Remaining resources				Total (B)	Total resources (A+B)
	Proved STD111	Probable			Feasibility STD221	Measured STD331	Indicated STD332	Inferred STD333		
		STD121	STD122							
<b>All India : Total</b>	<b>1556664</b>	<b>86930</b>	<b>120036</b>	<b>1763630</b>	<b>2773</b>	<b>765</b>	<b>21153</b>	<b>649940</b>	<b>674631</b>	<b>2438261</b>
<b>By States</b>										
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, 2007-08**

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
Tamil Nadu Minerals Ltd. 31, Kamrajar Salai, “TWAD” House, Chepauk, Chennai-600 005, Tamil Nadu.	Tamil Nadu	Vellore

**Table – 3 : Production of Vermiculite, 2005-06 to 2007-08  
(By State)**

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

State	2005-06		2006-07		2007-08(p)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>6674</b>	<b>5060</b>	<b>11827</b>	<b>8523</b>	<b>10801</b>	<b>8532</b>
Andhra Pradesh	3845	1730	10336	5206	9116	3948
Rajasthan	1412	177	-	-	-	-
Tamil Nadu	1417	3153	1491	3317	1685	4584

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**Table – 4 : Production of Vermiculite, 2006-07 and 2007-08  
(By Sectors/States/Districts)**

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

State/District	2006-07			2007-08 (p)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>3(3)</b>	<b>11827</b>	<b>8523</b>	<b>4(1)</b>	<b>10801</b>	<b>8532</b>
Public sector	1	1491	3317	1	1685	4584
Private sector	2(3)	10336	5206	3(1)	9116	3948
<b>Andhra Pradesh</b>	<b>2(3)</b>	<b>10336</b>	<b>5206</b>	<b>3(1)</b>	<b>9116</b>	<b>3948</b>
Nellore	2(2)	9451	4302	3	8166	2981
Visakhapatnam	(1)	885	904	(1)	950	967
<b>Tamil Nadu</b>	<b>1</b>	<b>1491</b>	<b>3317</b>	<b>1</b>	<b>1685</b>	<b>4584</b>
Vellore	1	1491	3317	1	1685	4584

*Figures in parentheses indicate the number of associated mines.*

**Table – 5 : Mine-head Stocks of Vermiculite, 2007-08(p)  
(By States)**

(In tonnes)

State	At the beginning of the year	At the end of the year
<b>India</b>	<b>6321</b>	<b>6941</b>
Andhra Pradesh	1837	2404
Madhya Pradesh	40	40
Tamil Nadu	4444	4497

**Table – 6 : Prices of Vermiculite, 2005-06 to 2007-08  
(Domestic Markets)**

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08(p)
Grade I	Ex-mine Sevathur (Tamil Nadu)	2240	2240	2240
Grade II	Ex-mine Sevathur (Tamil Nadu)	2300	2300	2300
Grade III	Ex-mine Sevathur (Tamil Nadu)	2355	2355	2355
Grade IV	Ex-mine Sevathur (Tamil Nadu)	2415	2415	2415
Grade V	Ex-mine Sevathur (Tamil Nadu)	2470	2470	2470
r.o.m.	Ex-factory S.Kota (Andhra Pradesh)	1300	1400	1400
Sized 12 MM	Ex-factory S.Kota (Andhra Pradesh)	1600	1600	NQ
4-8 mm.	Ex-works Gudur (Andhra Pradesh)	1500	1500	1500
2.4 mm.	Ex-works Gudur (Andhra Pradesh)	1400	1400	1400
1.2 mm.	Ex-works Gudur (Andhra Pradesh)	1200	1200	1200
Raw material	Ex-works Gudur (Andhra Pradesh)	500	500	500
Exfoliated	Ex-works Baroda (Gujarat)	7000-8000	7000-8000	7000-8000
Graded		1200	1200	1200
Raw ungraded		-	600	600

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### 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/m<sup>3</sup> 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.

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.

### CONSUMPTION

In 2007-08, the reported consumption of vermiculite was estimated at 1,400 tonnes. The refractory and asbestos-products industries were the main consumers of vermiculite (Table - 7).

**Table – 7 : Reported Consumption of Vermiculite  
2005-06 to 2007-08  
(By Industries)**

	(In tonnes)		
Industry	2005-06	2006-07	2007-08(p)
<b>All Industries</b>	<b>800</b>	<b>1300</b>	<b>1400</b>
Asbestos products	200 (1)	600 (1)	700 (1)
Refractory	600 (6)	700 (7)	700 (6)

*Figures rounded off. Data collected on non-statutory basis. Figures in parentheses denote the number of units in organised sector reporting industrial end-use consumption.*

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### WORLD REVIEW

Resources of 180 million tonnes are reported from USA and South Africa. Resources of other producing countries such as China, Russia, Brazil, Zimbabwe, etc. are not available. In 2007,

the total estimated production of vermiculite was 487 thousand tonnes in respect of countries for which data was available. South Africa, China and USA were the major producing countries (Tables - 8 and 9).

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

(In '000 tonnes)

Country	Reserve base
<b>World : Total</b>	<b>NA</b>
Brazil	NA
China	NA
Russia	NA
South Africa	80000
USA <sup>(e)</sup>	100000
Zimbabwe	NA
Other countries	NA

*Source : Mineral Commodity Summaries, 2008.*

**Table – 9 : World Production of Vermiculite  
(By Principal Countries)**

(In '000 tonnes)

Country	2005	2006	2007
Australia	9	9	9
Brazil	24	19	19
China <sup>(e)</sup>	100	110	110
Japan <sup>(e)</sup>	6	6	6
Russia <sup>(e)</sup>	30	30	30
South Africa	210	198	200
USA <sup>(e)®</sup>	100	100	100
Zimbabwe	23	13	13

<sup>(e)</sup> Sold or used by producers.

*Source : World Mineral Production, 2003-2007.*

## FOREIGN TRADE

### Exports

Exports of vermiculite decreased to 1,005 tonnes in 2007-08 from 2,351 tonnes in 2006-07. Exports were mainly to Japan, USA, UAE, Turkey and Belgium (Table - 10).

### Imports

Imports of vermiculite decreased to 34 tonnes in 2007-08 from 106 tonnes in 2006-07. Imports were mainly from Australia and Japan (Table - 11).

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

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>2351</b>	<b>9777</b>	<b>1005</b>	<b>6935</b>
Turkey	1009	4468	159	2805
Japan	180	939	264	1306
UAE	116	861	168	933
USA	-	-	204	637
Belgium	-	-	40	325
Spain	-	-	22	165
Indonesia	114	416	6	80
Norway	572	1907	20	48
Nepal	311	640	21	27
Poland	30	360	4	23
Other countries	19	186	97	586

**Table – 11 : Imports of Vermiculite  
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>106</b>	<b>6067</b>	<b>34</b>	<b>2123</b>
Australia	71	4645	20	1206
China	21	122	-	-
Japan	13	1270	8	661
UK	-	-	5	173
USA	1	30	1	83