



Vermiculite Health, Safety and Environmental Aspects

Introduction to Vermiculite and Environmental Aspects

Vermiculite is a member of the phyllosilicate mineral group and is micaceous in nature. It is found in many parts of the world but only a limited number of sources are worked as commercial deposits. The vermiculite is mined and refined using a variety of techniques and supplied commercially in a range of particle size grades of vermiculite concentrate (unexpanded).

Vermiculite is most commonly used in its exfoliated (expanded) form. The exfoliated vermiculite is lightweight (low bulk density), absorbent, non-combustible, and an excellent insulator that has proven useful in many environmentally beneficial and public safety related applications including:

- Fire protection to improve the safety of commercial and residential construction.
- Fire rated door assemblies and wallboards (both gypsum and vermiculite based).
- Growing media and soil amendments for fruits, vegetables, and many flowers.
- Insulating media in home construction that reduces energy consumption and costs.
- Lightweight concrete to improve insulation and increase noise absorption.
- Animal feedstuffs to preserve integrity of feed and promote the health of livestock.
- Bio-remediation aid to clean contaminated soils and sites.
- Packaging aid for the safe transport of many kinds of materials, including spill containment of liquids.

Other forms of vermiculite include finely ground and liquid dispersions, each of which utilize vermiculite's high aspect ratio platelets to produce unique end-use applications.

Providing the vermiculite is used and handled in accordance with the suppliers' recommendations, it can be used in a safe and environmentally friendly way. As with all other materials it is important to adopt normal good working practices and to comply with local and national regulatory requirements. Requirements do vary on a country by country basis and it is advisable that local agencies be contacted regarding specific requirements.

The following notes are intended to provide guidance on some particular aspects relevant to health, safety, and environmental matters. Additional data on particular items may be available from The Vermiculite Association on request.

Vermiculite and Health Aspects Associated with Potential Contaminants

Vermiculite is a naturally occurring, mica-type mineral that has been used beneficially in numerous industrial applications since the late 1940's. It has been demonstrated as being safe to use, and no serious health risks have been found resulting from exposure to vermiculite.

Information given in this booklet is only intended as an introduction to health, safety and environmental aspects of vermiculite. It does not necessarily relate to a specific source of vermiculite. Further information can be obtained from various references given and from the supplier of the vermiculite. The Vermiculite Association (TVA) does not guarantee the accuracy of information contained in this booklet.

Vermiculite and other ore bodies can contain a variety of associated minerals such as mica, quartz, feldspar, etc. The associated minerals are unique to a particular deposit and, in some cases, may include minerals which could pose a health risk if present in significant quantities. In most countries, manufacturers are required to publish and make available Material Safety Data Sheets (MSDS). These sheets will typically identify any hazards associated with the material and also provide information on safe handling and proper disposal.

Asbestos fibres are a potential risk to health, and in the past there has been some vermiculites contaminated with trace amounts of asbestiform material. Vermiculite ore bodies currently in use by the major producers, do not pose a health risk when used in accordance with the manufacturer's MSDS. However, there are numerous sources of commercial vermiculite available in the world today and it is important for the end user to understand test data from a particular manufacturer.

Such testing should take into account both mineralogical and morphological differences between asbestos and non-asbestos varieties of the same amphibole or serpentine mineral.

Finally, it is important to note that the issue of potential for fibrous asbestos contamination exists for a wide range of naturally occurring materials. Included in this list are materials such as sand, clay, and gypsum. Due to this, and other studies referencing background levels of asbestos in the environment, it is inappropriate to state that any naturally occurring material is asbestos free. Any reference to trace asbestos levels must include (as a minimum): analysis technique, detection limit, and definition of asbestos used in the study.

Crystalline Silica

Vermiculite, in ore concentrate and exfoliated state, may contain small quantities of crystalline silica, as quartz. This is usually only present as non-respirable particles but mechanical action such as milling may reduce any quartz that may be present to a respirable particle size. Silica is a very abundant material in a variety of forms and accounts for approximately 20% of the earth's crust with 95% being quartz. It is present in nearly all mining operations, and as an extremely common mineral has been the subject of many detailed studies, summarized in the Crystalline Silica Primer published by the US Bureau of Mines.

Trace amounts of free silica are often found in silicate minerals while materials such as sand and gravel consist mainly of free silica.

It has been known for centuries that prolonged and excessive exposure to high concentrations of respirable free silica in dust can cause a related lung disease of occupational origin, silicosis. This is a non-cancerous, but extremely serious lung disease. Recent attention has focused on a relationship between silica and lung cancer. Confounding factors in human studies and flaws in animal studies have not given rise to conclusive evidence, however the International Agency for Research on Cancer (IARC) have now classified crystalline silica as a carcinogen.

Some countries will even require any material containing more than 0.1% crystalline silica to be labelled as a carcinogen.

Information given in this booklet is only intended as an introduction to health, safety and environmental aspects of vermiculite. It does not necessarily relate to a specific source of vermiculite. Further information can be obtained from various references given and from the supplier of the vermiculite. The Vermiculite Association (TVA) does not guarantee the accuracy of information contained in this booklet.

Control Measures and Personal Protective Equipment

Like all materials, vermiculite can be subject to control measures with regard to its handling, use in processing, transportation, end use and possible disposal. Since local and national requirements vary from country to country it is not possible to deal with them individually in this brief note, and users should check for any statutory requirements.

As with numerous finely divided particulate materials, inert or nuisance dust may be released during handling of vermiculite. Other commercially important materials with similar dusting characteristics include sugar, grain, cement, and sand. Symptoms associated with inhalation exposure to airborne dust may include coughing, sneezing, and minor upper respiratory irritation. Inhalation over long periods of substantial amounts of any inert dust can overload the lung clearance mechanism, making the lungs more vulnerable to respiratory disease. Skin and eye contact may also cause minor physical or mechanical irritation.

It is important that dust control measures be instituted to ensure that airborne dust levels are kept below regulatory limits if they exist. In general dust concentrations of above 10mg/m³ total inhalable and 5mg/m³ respirable are considered a risk to health. While these levels could be reached in commercial operations they are unlikely to exist in domestic use.

In the United States, the Occupational Safety and Health Administration (OSHA), has established a Permissible Exposure Limit (PEL) which is the maximum amount of airborne crystalline silica that an employee may be exposed to during a working shift. Other countries may have similar limits.

Dust control measures should be used in preference to Personal Protective Equipment (PPE) where ever possible. If control measures can not be instituted the following PPE is recommended;

- a dust respirator to protect against inhalation exposure.
- safety glasses with side shields or safety goggles to prevent mechanical or physical eye irritation.

It should be noted that most suppliers regard the use of PPE as part of good hygiene practice regardless of regulatory exposure limits.

References

Addison, J. "Vermiculite: A Review of the Mineralogy and Health Effects of Vermiculite Exploitation" Regulatory Toxicology and Pharmacology 21, 397-405, 1995.

Amandus, H.E., Wheeler, R., Jankovic, J., and Tucker, J. "The Morbidity and Mortality of Vermiculite Miners and Millers Exposed to Tremolite-Actinolite: Part I, Exposure Estimates" Am. J. Ind, Hyg. 11,1-14,1987.

Amandus, H.E., and Wheeler, R. "The Morbidity and Mortality of Vermiculite Miners and Millers Exposed to Tremolite-Actinolite: Part II, Mortality" Am.J. Ind, Hyg. 11, 15-26, 1987.

Gien, R.E. "Health effects of crystalline silica" 10th Industrial Minerals Congress, 1992.

Information given in this booklet is only intended as an introduction to health, safety and environmental aspects of vermiculite. It does not necessarily relate to a specific source of vermiculite. Further information can be obtained from various references given and from the supplier of the vermiculite. The Vermiculite Association (TVA) does not guarantee the accuracy of information contained in this booklet.

Goldstein, B., Rendall, R.E.G. "The relative toxicities of the main classes of minerals" Pneumoconiosis proceedings of the International Conference Johannesburg, 1969.
Hunter, B., Thomson, C. "Evaluation of the tumorigenic potential of vermiculite by Intrapleural injection of rats" British Journal of Industrial Medicines, Vol 30, 1973.

IARC Monograph Volume 68 Silica, Some Silicates, Coal Dust and para-Aramid Fibrils, 1997.

Paoletti, L. et. al. "Mineral Particles in the Lungs of Subjects Resident in the Rome Area and not Occupationally Exposed to Mineral Dust" Environ. Res., 44(1), 18-28, 1987.

Swenson, A. "Experimental investigations on the fibro-genetic effects of the mica mineral vermiculite" Scientific pamphlet series 1975:11 The Worker-Protection Department Stockholm, 1975.

US Bureau of Mines. Crystalline Silica Primer US Department of the Interior, 1992.

US Department of Labor, Mine Safety and Health Administration. "Asbestiform and/or Fibrous Minerals in Mines, Mills, and Quarries", 1980.

The Vermiculite Association

Kingsley House, Ganders Business Park, Kingsley,
Bordon, Hampshire, GU35 9LU, United Kingdom
Tel. +44 1420 471627 F ax +44 1420 471611

tva@vermiculite.org www.vermiculite.org

TVA is a Domestic Not for Profit Corporation Incorporated in the State of New York, USA



Information given in this booklet is only intended as an introduction to health, safety and environmental aspects of vermiculite. It does not necessarily relate to a specific source of vermiculite. Further information can be obtained from various references given and from the supplier of the vermiculite. The Vermiculite Association (TVA) does not guarantee the accuracy of information contained in this booklet.