

Asbestos

Asbestos is a commercial term that represents several different silicate minerals which separate into long thin fibers, are heat resistant, and are chemically inert. Over the years, asbestos has been used in numerous commercial applications including fire proofing materials, ceiling tiles, floor tiles, insulation, brake linings, and many more. Since the nineteen seventies, the use of asbestos in commercial products has greatly diminished due to health concerns and demonstrated links to diseases such as asbestosis, mesothelioma and lung cancer. Asbestos can be divided into two major classes of minerals, serpentines and amphiboles.

1. Serpentine

Chrysotile (includes the minerals clinochrysotile and orthochrysotile) is the only asbestos mineral of the serpentine group and has been the most widely used commercially. Chrysotile is a sheet silicate comprised of bundles of extremely small, tightly rolled sheets that form tubes or rods. Chrysotile has been more widely used than amphibole asbestos because it is usually more flexible, forms longer thinner fibers, and can easily be woven into cloth. Chrysotile is not as chemically inert as the asbestiform amphibole minerals.

2. Asbestiform Amphibole

All other asbestos belongs to the amphibole family of minerals. Amphiboles are chain silicates that include over fifty different minerals, most of which do not crystallize in asbestiform varieties. Of the few amphiboles recognized to crystallize in asbestiform varieties, those that have been used commercially are grouped into five materials that are referred to both in commercial and regulatory nomenclature as; **amosite** (includes the asbestiform varieties of the amphibole minerals cummingtonite and grunerite), **crocidolite** (asbestiform variety of the mineral riebeckite), **tremolite** (asbestiform variety of the mineral tremolite), **actinolite** (asbestiform variety of the mineral actinolite), and asbestiform **anthophyllite**. Other amphiboles can occur in asbestiform varieties, but these minerals have generally not been used in commercial products and are often not cited in the regulatory literature.

[CFR-2010-title40-vol30-part763-subpartE-appA.pdf \(govinfo.gov\)](#)

Activity-Based Sampling - An empiric approach in which airborne concentrations of asbestos are measured during an event where the source material (soil or dust) is disturbed rather than predicted or modeled from source material concentration.

Actinolite - A calcic amphibole mineral in the tremolite-ferroactinolite solid solution series. Actinolite can occur in both asbestiform and nonasbestiform mineral habits. The asbestiform variety is often referred to as actinolite asbestos. A mineral in the calcic amphibole group. It is generally not used commercially, but it is a common impurity in chrysotile asbestos.

Analytical sensitivity - Airborne asbestos concentration represented by each fiber counted under the electron microscope. It is determined by the air volume collected and the proportion of the filter examined.

Asbestiform - A specific type of mineral fibrosity in which the fibers and fibrils possess high tensile strength and flexibility.

Asbestos Containing Product - Means any product to which asbestos is deliberately added in any concentration or which contains more than 1.0 percent asbestos by weight or area.

Asbestos Structure - Individual Fiber or any connected or overlapping grouping of asbestos fibers or bundles with or without other particles.

Aspect ratio - A ratio of the length to the width of a particle. Minimum aspect ratio as defined by this method is equal to or greater than 5:1.

Bundle - A structure composed of three or more fibers in a parallel arrangement with each fiber closer than one fiber diameter.

Cleavage - Breaking of a mineral along one of its crystallographic directions.

Cleavage Fragment - Fragment of a crystal that is bounded by cleavage.

Cluster - A structure with fibers in a random arrangement such that all fibers are intermixed and no single fiber is isolated from the group. Groupings must have more than two intersections.

Detection Limit - The minimum concentration of an analyte in a sample, that with a high level of confidence is not zero.

Electron Diffraction - Technique in electron microscopy by which the crystal structure of a specimen is examined.

Elongate Mineral Particle (EMP) - Any mineral particle with a minimum length to width ratio (aspect ratio) of 3:1.

Fibril - Single fiber of asbestos which cannot be separated longitudinally into smaller components without losing its fibrous properties or appearances.

Fiber - A structure greater than or equal to 0.5 μm in length with an aspect ratio (length to width) of 5:1 or greater and having substantially parallel sides.

Fiber Bundle - Structure composed of parallel, smaller diameter fibers attached along their lengths.

f/cc - Fibers per cubic centimeter. Units of measurement for asbestos in air.

Matrix - Structure in which one or more fibers or fiber bundles touch, are attached to, or are partially concealed by a single particle or connected group of non-fibrous particles.

PCM - Phase contrast microscopy.

Structure - A microscopic bundle, cluster, fiber, or matrix which may contain asbestos.

TEM - Transmission Electron microscopy.