

Asbestos: an on-going battle

Asbestos, the name of which derives from the ancient Greek term *asbestos*, meaning “unquenchable”, is also known as *amianthus*, also from the ancient Greek *amiantos*, meaning “incorruptible”. As both names suggest, the fibres of the minerals that are classified in this category are known for their resistance and have the advantage of being incombustible, as well as suitable for weaving. Unfortunately, however, asbestos has become notorious for the damage that it causes to health and in particular for its proven carcinogenic action which, in Italy alone, causes the death of thousands of people each year.

Mineralogy

Asbestos belongs to the class of silicates, the most commonly found minerals on Earth, composed prevalently by silicon and oxygen. Depending on the type of binding between the molecules in their composition, silicates are subdivided into various subgroups, including inosilicates (from the Greek *inós*, meaning “fibre”, due to their typical chain structure) and phyllosilicates (from the Greek *phýllon*, meaning “sheet”, due to their typical lamellar structure), the two groups from which the six compounds derive that, according to Italian regulations, are known as asbestos. Crocidolite, or blue asbestos, amosite, anthrophyllite, actinolite and tremolite derive from calcium and magnesium silicates, the amphiboles (inosilicates); serpentine (phyllosilicates), which includes chrysotile, also known as white asbestos, derives from magnesium silicates.

The chemical composition of asbestos is therefore variable, but in general it can be found in rocks in the form of fibrous aggregates that may be several metres in length. To give you an idea of the fine dimension of these bands of fibres, it is enough to say that 335 thousand fibrils of asbestos can be contained in a space occupied by 250 hairs laid side by side (approximately 1 cm).



Asbestos, mineral

Use of asbestos from the 19th to the 20th century

Known from ancient times, the physical and chemical characteristics of asbestos - typically resistance to fusion, flexibility, resistance to wear, to chemical and microbiological agents and capacity to guarantee heat and electrical insulation - led it to be used on a wide scale as from the end of 1880, the date that marks the beginning of extraction of asbestos for industrial purposes, until production reached five million tons per year in the 1970s.

Asbestos has found application in thousands of products and has been used in numerous sectors, such as the building

industry (above all for heat and electrical insulation and for its soundproofing properties), the transport, textiles, naval, military, chemical, paper and cosmetics industries, and even in the entertainment and design sectors ... A notable example is a deckchair made of Eternit (asbestos cement) designed in 1954 by Willy Guhl from Switzerland. From the 19th to the 20th century, all over the world, asbestos was widely used for pipes, slabs, chimneys, walls, suspended ceilings, in electrical insulation tape, synthetic textiles, brakes, clutches, roof insulation, paper and cardboard, sanitary towels, insoles for shoes, face powder, baby powder, artificial sand for sand boxes... The list could go on for a long time, but in short, we can say that up to the 1980s, asbestos was more or less everywhere and it was used even to make items designed for direct contact with humans and in very many materials used to build our homes, schools and workplaces.

What at that time seemed to be an ideal material, was later revealed to be a real hazard for our health. We now know for certain, and have done for several decades, that asbestos is responsible for serious illnesses, but let us find out more.



Asbestos fibre seen through a microscope – Source Wikipedia

Impacts on health

As indicated clearly by the World Health Organisation (WHO), all types of asbestos are carcinogenic and exposure to asbestos, which takes place by inhalation of fibres present in the air, causes lung cancer, mesothelioma (the tumour that develops in the mesothelium, the membrane covering the internal organs of the chest and abdomen and the space around the heart), cancer of the larynx, of the ovaries and asbestosis, a chronic lung disease, due to repeated inhaling of asbestos fibre over time.

According to the Italian Ministry of Health, the most hazardous material is asbestos cement (also known as Eternit), a material made of asbestos and cement, which has the characteristic of being particularly friable and, therefore, when subjected to damaging or crushing, releases fibres into the surrounding environment. In order to be considered as fibre, a particle must have a length/diameter ratio higher than or equal to 3 (that is it must have an elongated shape) and in order to be inhaled it must have a length greater than 5 microns and a width of less than or equal to 3 microns, measurements within which most asbestos fibres alarmingly fall.

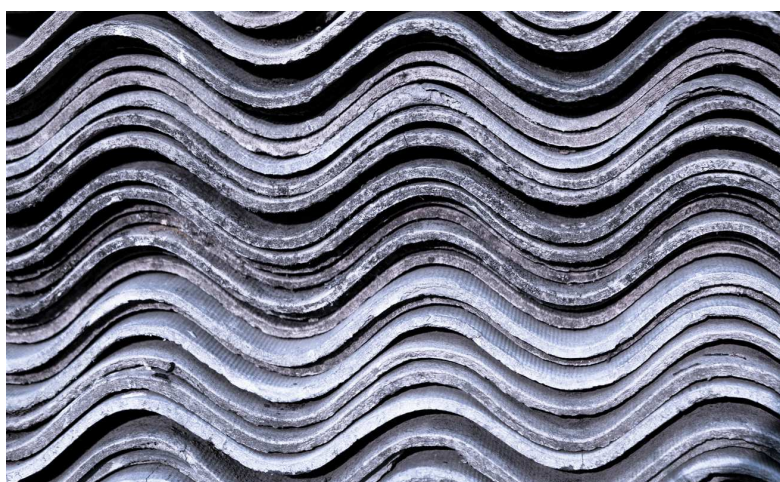
The greatest risks are linked to the presence of fibres in the air which, once inhaled, may be deposited within the respiratory system and, when they reach the deepest parts of the lungs, may remain trapped there for many years, if not for the whole life of an individual.

It is precisely the presence of these fibres in the lungs that may cause the onset of the serious illnesses listed in the previous paragraph, some of which – in particular mesothelioma and lung cancer – may become manifest many years after exposure to asbestos (mesothelioma may appear up to 40-50 years after exposure).



Removing asbestos

According to the National Asbestos Observatory – an Italian association aiming to ban asbestos at global level – this time delay between exposure and appearance of the illness, combined with the fact that it is forecast that decontamination, in Italy, will not be completed until 85 years from now, will mean that people will continue to die due to exposure to asbestos for the next 130 years. This is despite the fact that Italy banned asbestos with an avant-garde law, dated 27 March 1992, the first article of which strictly prohibits "extraction, importation, exportation, sale and production of asbestos and products containing asbestos." This same law also gives instructions on decontamination operations and – be careful! – if you need to decontaminate asbestos from an area, call in a specialised company!



Asbestos roofing sheets

History and extent of use of asbestos

According to WHO data, about 125 million people all over the world are currently exposed to asbestos at work. In 2004, there were approximately 107 thousand deaths due to occupational exposure to asbestos, a figure that does not include deaths due to exposure occurring outside workplaces.

The asbestos industry has left a tragic mark on Italian history too. In 1978, consumption of asbestos in this country totalled about 165 thousand tons and Italy was also one of the leading countries for extraction of this mineral, present in high quantities in Val Malenco.

One of the most tragic experiences in our country related to asbestos occurred in Casale Monferrato in Piedmont, where the Eternit company manufactured asbestos cement in an area measuring 94 thousand square metres with as many as 3,400 workers in peak production periods, from 1907 to 1986, despite research showing how hazardous asbestos is dated from before the closure of the factory. During the 1970s, a significant increase in the number of deaths due to mesothelioma was noted in the medical ward at the hospital in Casale Monferrato, not only amongst the workers at the Eternit plant, but also amongst the other inhabitants of the town. In 1987, Riccardo Coppo, at that time mayor of Casale, issued an order prohibiting the use of asbestos in the town. Subsequently, the town of Casale sued Eternit for damages in a famous court case that ended in 2014 with the reversal by the Court of Cassation of the conviction for causing environmental damage for Swiss entrepreneur Stephan Schmidheiny (fully and finally acquitted due to the statute of limitations for the crime and now charged in the Eternit-bis criminal proceedings with the voluntary manslaughter of 258 people).

Regardless of the outcome of the court cases, one thing is certain: the battle against asbestos is set to continue for a long time, it goes beyond our national borders and will require even greater efforts with regard both to production of this material, and to decontaminate and making areas safe. Today the most important manufacturer's and exporters of asbestos are Russia, Brazil, Chile and Canada, although the government of the latter has decided to prohibit production of asbestos as from 2018. In Brazil too, the Supreme Federal Court (Stp) has confirmed the validity of the law passed in 2007, in the State of São Paulo, prohibiting production and use of materials containing asbestos. This ruling may mark the beginning of a process towards a ban on asbestos in the rest of Brazil too.

Anna Pellizzone

For further information:

- salute.gov.it
- chem.uniroma1.it
- lastampa.it
- it.wikipedia.org
- unipd-org.it
- Bagatti, Corradi, Desco, Ropa, Chimica © Zanichelli Editore 2012. Capitolo 3, I legami chimici.
- airc.it
- who.int
- osservatorioamianto.com
- it.wikipedia.org