Inorganic substances in buildings

Carbon oxides

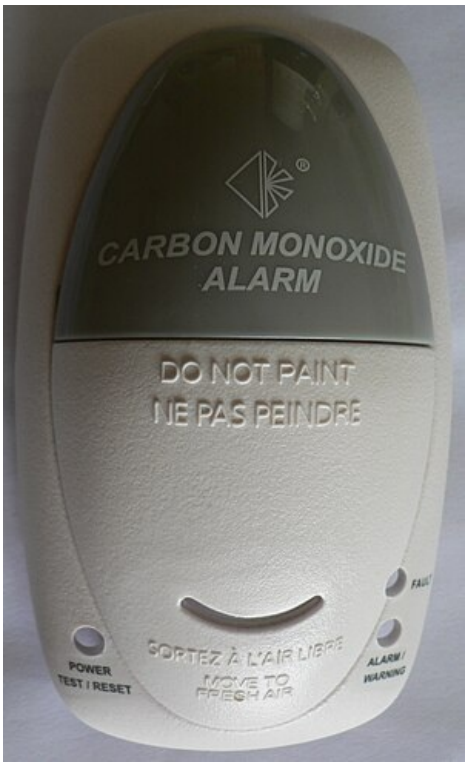
During combustion, large amounts of carbon monoxide (CO) and carbon dioxide (CO_2) are produced. The concentration of CO_2 increases if more people are present, there is smoking, or of there is another source of combustion products (stove) in the room.

Carbon monoxide

Carbon monoxide is a colorless, odorless gas produced by incomplete combustion. It has a high affinity for hemoglobin , CO poisoning (> 10% carbonylhemoglobin) has a number of degrees and the consequences are dependent on the duration of exposure and concentration. If a person survives severe poisoning, which is usually associated with prolonged unconsciousness , the CNS and cardiovascular system are often affected . CO poisoning is easily demonstrated by determining the concentration of COHb in the blood. Symptomatology may be less in smokers whose blood COHb concentration is between 5-10%. Even a COHb concentration of 2.5% can worsen the condition of people with angina pectoris . The binding of CO to the blood dye is reversible, and in case of poisoning it is recommended to take the affected person to fresh air, or application of oxygen therapy . The affinity of CO to Hb is about 210× higher than that of O_2 . According to some authors, chronic exposure to CO accelerates the development of atherosclerosis[1], but this effect of CO has not been clearly proven[2].

Measurement of the concentration of carbon oxides

- **The CO concentration** is measured using detection tubes that change color according to the gas concentration, passive dosimeters working on the principle of color reaction (they are suitable for qualitative evaluation), and electrochemical analyzers.
- **The CO_2 concentration** is measured by continuous spectrophotometric determination in the infrared region of the spectrum.



CO detector

Nitrogen oxides

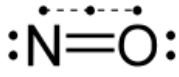
The source of **nitrogen oxides** is combustion, mainly during heating and cooking with gas. **Nitric oxide** (NO) is formed , which is converted into nitrogen dioxide NO 2 . In buildings where gas appliances are used, NO 2 concentrations reach higher concentrations than in the outdoor environment, even more than 10x.

Nitrogen dioxide (NO_2) is a tissue-soluble gas. In high concentrations, it damages lung tissue . Alteration of lung functions occurs at concentrations of NO_2 above 4 mg/m^3 , in asthmatics already at 0.2 mg/m^3 . Children are much more sensitive, respiratory symptoms appear as early as at a NO_2 concentration of 0.09–0.5 mg/m^3 . Cough , burning and dryness of the mucous membranes, shortness of breath appear , in more severe cases, pulmonary edema may occur , even with a latency of 72 hours after exposure.

Sulfur oxides

The main representative is **sulfur dioxide** ($SO_{2)}$. Its concentration is an indicator of outdoor air pollution. It mostly gets into the building through ventilation. There is an effect on the upper respiratory tract, people with chronic diseases of the cardiovascular and respiratory systems, the elderly and children have the biggest problems.

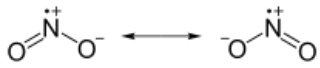
Sulfur trioxide ($SO_{3)}$ is more dangerous . It's more irritating. It typically appears in dense


Nitric oxide

fog. It causes contractions of the smooth muscles of the airways, even in small concentrations.

Asbestos

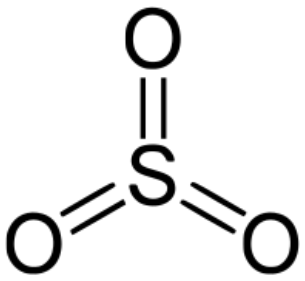
Asbestos


Nitrous oxide

is a crystalline form of magnesium silicate ($MgSiO_3$). Previously, it was widely used in fire partitions of various buildings (including residential ones). It is still used in the production of heat-resistant fire suits.

Damaged health

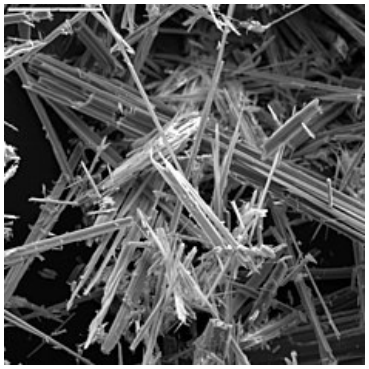
Asbestos forms very fine fibrous crystals that look like cotton wool. These are released in the form of an aerosol when working with asbestos . The most dangerous are fragments with a size of **5 to 0.5 µm** . Long-term inhalation of these crystals leads to so-called asbestosis , severe damage to the lung parenchyma. Crystals with a size of **1 to 0.5 µm** reach the most peripheral parts of the lungs. This leads to mechanical irritation and cell damage, which can even have a carcinogenic effect . The tumor that arises arises from the pleural epithelia and is referred to as mesothelioma. Its incidence increases up to a thousand times with long-term (even several decades!) inhalation of asbestos fragments !



Sulfur trioxide

Prevention

The best way to prevent asbestosis is to use appropriate respiratory equipment and full body protective suits. In recent decades, the use of asbestos has been withdrawn, despite its good heat-resistant properties.


Antrofylit, one of the forms of asbestos

Links

Related articles

- Organic substances in buildings
- Microbiological and biological risks of staying in buildings

External links

- https://arnika.org/azbest

Bibliography

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