Insulfrax® Products

Crystalline Silica - the Facts

What is crystalline silica?

Silica is a term commonly used for silica dioxide or SiO_2, one of the most abundant minerals found in the earth's crust. This naturally occurring mineral can be found in the amorphous or vitreous (glassy) state, in fused form, and in crystalline forms. Making up roughly 18% of the earth's crust, most naturally occurring silica deposits are found in the form of crystalline quartz. Common natural sources of quartz include beach sand, limestone, clay, shale and granite. Another form of crystalline silica, resulting primarily from high-temperature processes, is referred to as cristobalite. Industrial uses of quartz and cristobalite (as sand) include the manufacture of tableware and sanitaryware, foundry castings and refractory bricks.

What is the concern over crystalline silica?

The health concern over crystalline silica is associated with the inhalation of respirable particles. When inhaled some forms of crystalline silica can cause a specific lung disease called silicosis. This is an irreversible scarring of the lung tissue which can further develop into lung cancer. For this reason, workplace exposures to fine airborne crystalline silica containing dust must be minimised.

How is it regulated?

While a regulatory classification of crystalline silica does not exist on European level, most member states established workplace limits for quartz, cristobalite and tridymite.

Can crystalline silica be found in AES wools?

Alkaline Earth Silicate (AES) wools do not contain crystalline phase silica as produced, therefore, there is no potential exposure to crystalline silica during handling, processing, use and/or installation of Insulfrax® products. Whilst no crystalline silica is present as produced, it is known that all "glassy" fibres containing sufficient amounts of silica can "devitrify". This means that crystal phases may be formed under the influence of elevated temperature and time. The devitrification process has several stages; AES wool can form cristobalite and tridymite at the final stage of devitrification. It is however important to know, that the fibrous form remains intact and any silica crystals are embedded in the glassy fibre.

Can the handling of AES wool products result in exposure to crystalline silica?

Exposure to airborne dust containing crystalline silica may be possible during activities associated with after use AES material (e.g., repair or removal of after-service insulation; routine maintenance). However, In a typical AES wool furnace lining, devitrification only occurs in a portion of the of the insulation nearest to the 'hot face'. Therefore fibres containing crystalline silica, represent a small fraction of the overall lining. This often leads to measured exposures to crystalline silica, during furnace lining wrecking, being too low to be detected.

Do conventional 'hard' refractories contain crystalline silica?

Conventional hard refractories can contain up to 70% crystalline silica as produced. With conventional refractories, exposure to crystalline silica can occur during both the handling and installation of new materials as well as during repair and removal activities. Hard refractories also produce significantly more crystalline silica during operation. The poorer insulating properties of brick or concrete linings results in a greater portion of the available silica being exposed to high temperature. This situation is made worse by the fact that these linings are relatively dense and thereby produce more crystalline silica by weight / volume than the less dense fibre linings. Conventional refractories typically require more energy intensive removal techniques (e.g. use of a jack hammer) which can greatly increase the possibility of creating airborne dust.

Has there been any further testing on AES wool products after use?

Numerous toxicological tests have been carried out on devitrified fibres. These tests included animal inhalation and injection studies as well as specific laboratory studies using cell cultures. None of the animal tests resulted in any adverse health findings and the cell culture tests confirmed a low biological activity of after service fibres. The interpretation of the test results is in line with epidemiological observations, indicating that the formation of human disease is related to the crystal surface (only freshly cleaved silica shows biological interaction), while in after-service fibres the silica crystals are embedded in a matrix composed of other crystals and glass – they are not readily available for biological interaction.

How do I ensure occupational exposure limits are not exceeded?

As mentioned, most European member states established OELs (occupational exposure limits) for respirable quartz, cristobalite and tridymite. The test methods to analyse the workplace air cannot make a distinction between "free, freshly cleaved" crystalline silica and crystals embedded in fibres. To evaluate the potential workplace exposure, almost 200 air samples were taken in furnace removal operations, where its known that exposures to after service fibres are typically high and difficult to control. Cristobalite was detected in 3% of the samples and in only 1 case (0.5%) was above the most stringent OEL of 0.05 mg/m³. This allows to conclude that crystalline silica will not be detectable as long as fibre levels are controlled – where this isn´t technically feasible, we recommend respiratory protection to ensure that worker risk is minimised.

Unifrax Ltd.

T:+44 (0)1744 88 7600 F:+44 (0)1744 88 9916

www.unifrax.com

U-CS200 EN
Rev: 0 Oct 10