

Panel discussion

Fly ash is classified in Israel as “hazardous dust” due to its free crystalline silica (appearing only in the form of quartz) content. This classification applies to any weight percentage of quartz in the fly ash (even if it is less than 0.1 percent).

One of the repercussions of this definition is that fly ash must be related to as siliceous “hazardous dust” regardless of its actual crystalline silica content.

Moreover, in Israel, unlike in many other countries, the crystalline silica regulations hold not only for the respirable fraction, which may cause silicosis or other chronic lung diseases, but for the inhalable fraction of the dust as well.

This is not in agreement with the convention in many countries that coal ash dust and dust containing less than 1% silica (and no other hazardous material) should not be classified as hazardous dust.

The respirable fraction of particulate matter in bottom ash amounts to only 0.4% (w/w), and part of it never becomes airborne because it is trapped among very coarse particles. The concentration of respirable free silica in bottom ash is very low (0.002%)

It was found in analysis of Israeli fly ash dust that the concentration of quartz in the inhalable fraction (under 200 μ m aerodynamic diameter) and the respirable fraction (under 10 μ m aerodynamic diameter), is 2.3%-4.3%, and 2.5%-2.9%, respectively.

The percentage of aluminosilicates in the ash is 60%-80%. Due to chemical reactions that occur at the combustion temperature in the boilers(1500°C), most of the quartz is coated with aluminosilicates, so that the percentage of available biologically active quartz in

The respirable fraction does not exceed 1%. The amorphous silica is vitreous, and based on international publications poses no health risk.

Definition of PNOS (nuisance dust) by ACGIH

- Do not Have an applicable TLV.
- Are insoluble or poorly soluble in water (or, preferably, in aqueous lung fluid if data are available).
- Have low toxicity
- Are not cytotoxic, genotoxic, or otherwise chemically reactive with lung tissue.
- Do not emit ionizing radiation
- Do not cause immune sensitization
- Do not cause toxic effects other than by inflammation or the mechanism of "lung overload".

For such particles airborne concentration should be kept below 3 mg/M³ respirable particles and 10 mg/M³, inhalable particles, until such time as a TLV is set for a particular substance. The value is for particulate matter containing no asbestos and <1% crystalline silica.

Comparison of properties of coal ash and those required to classify a substance as “particulate not otherwise specified” (nuisance dust) by ACGIH

Classifying property

Insoluble

Low toxicity

Not cytotoxic

Not mutagenic

Not carcinogenic

Not radioactive

**Does not react chemically
with the lungs**

Coal Ash

Metals may be soluble

Low toxicity

**Low cytotoxicity in certain
animal cells**

Not mutagenic

No evidence found

**May reach 1%-5% above
background level**

**Biological activity similar
to nuisance dust**

Approach to coal ash in other countries

Coal ash is classified as particulate not otherwise specified or “nuisance dust” in leading countries in the world.

The American Occupational Safety and Health Administration – OSHA – does not classify coal ash under the definition of hazardous substances.

In the Netherlands and other countries, coal ash is classified as “nuisance dust.”

It can be inferred from the COSHH-HSE regulations in the UK that coal ash is classified as nuisance dust due to its assigned OEL which is similar to other nuisance dusts such as gypsum and cellulose.

The approach to coal ash in other countries

Since 1993, Coal ash has not been included in the regulations covering hazardous waste in the United States. Some of this ash, which is used to fill earth and mines, is classified as non-hazardous waste.

Mixing coal ash into cement and concrete products is not restricted in the United States.

In the EC, coal ash waste is classified as non-hazardous waste.

The crucial questions raised:

Does fly ash comply with the definition of ACGIH for PNOS (since ACGIH standards are adopted legally Israel)?

Should the regulator classify crystalline silica in fly ash differently from silica in other sources based on the existing evidence of its biological and epidemiological activity in coal ash?

Proposed classification for coal ash **(in Israel)**

**The classification of coal ash (fly
and bottom) as “nuisance dust,”**

**the common practice in Europe and the
United States (in one of the various
definitions for nuisance dust).**

Methodological problems encountered in assessment of exposure to free silica

**In certain mixtures of raw materials, it is unable
to separate the assessment of the silica content
corresponding to fly ash from that
corresponding
to other materials present in the same mixture.**

Example: cement and concrete.

Methodological problems encountered in assessment of exposure to free silica

There are difficulties in separating the assessment of silica incorporated in the surface area of a fly ash particle from that of silica embedded in the vitreous phase of this particle.

consequence: This may lead to an overestimation of the relevant biologically active mass percent of free silica in the fly ash.

Methodological problems encountered in assessment of exposure to free silica

At present, it is a technically difficult to separate the content of free silica originating in ash from that originating in the sandy soil on which power stations may be located (close to the sea).

The official standards do not relate to separation of different sources of silica.

Result: Possible overestimation of exposure to crystalline silica.

Methodological problems encountered in assessment of exposure to free silica

In certain industries using cyclone as a standard apparatus for personal sampling of respirable dust fraction makes it difficult to collect a sufficient amount of respirable dust for the determination of the percent mass of free silica in the dust by XRD.