POSITION PAPER

RESPIRABLE CRYSTALLINE SILICA IN IRON OXIDE PELLETS [IRON ORES, AGGLOMERATES, EINECS NO. 265-996-3, CAS NUMBER 65996-65-8]

The CLP Regulation

The CLP Regulation[1] in Europe implements the Globally Harmonised System of Classification and Labelling of Chemicals (GHS) developed by the United Nations.

Title V of the CLP Regulation requires that from 1 December 2010 substances within one month of placing on the market, which meet the criteria for classification as hazardous substances according to the CLP Regulation and substances subject to registration (regardless of classification or otherwise) under REACH must be notified must be notified to the classification and labelling inventory of the European Chemicals Agency (ECHA). It is a legal obligation for each Manufacturer/Importer on the EU market to classify the substances (and mixtures) they manufacture/import in the EU.

This notification concerns every substance (product) which either meets the criteria for classification as hazardous or is subject to the registration (regardless of classification) duty under REACH.

In the case of crystalline silica[2], although there is no harmonised EU classification for this group of substances under the former European Dangerous Substances Directive, it has been current practice for many years to self classify and label crystalline silica flours as harmful with the label Xn and the risk phrases R48/20.

Possibility to distinguish the form

The CLP Article 8.6 specifies that "Tests that are carried out for the purposes of this Regulation shall be carried out on the substance or on the mixture in the form(s) or physical state(s) in which the substance or mixture is placed on the market and in which it can reasonably be expected to be used." In addition, the ECHA Guidance to the CLP Regulation published on 13 July 2009 mentions that "for human health, different forms (e.g. particle sizes, coating) or physical states may result in different hazardous properties of a substance or mixture in use" and therefore they may be classified differently. It is therefore justifiable to consider **quartz and cristobalite in their respirable form** – hereafter named as "RCS" - for the purpose of classification.

Classification

The Iron Platform proposes to follow the IMA-Europe[3] approach. IMA-Europe suggests classification of respirable quartz and respirable cristobalite as **STOT RE 1**[4] for the silicosis hazard.

Consequently, mixtures and substances containing RCS, whether in the form of an identified impurity, additive or individual constituent, shall be classified (according table 3.9.4, CLP) as
- STOT RE 1, if the RCS concentration is equal to, or greater than 10%;
- STOT RE 2, if the RCS concentration is between 1 and 10%.

Where the RCS content in mixtures and substances is below 1%, it does not trigger a classification.

Forms or physical states in which iron oxide pellets are placed on the market

Iron oxide pellets are used for the manufacture of blast furnace iron or direct reduced iron in the iron and steel industry. The principal feedstock for iron oxide pellets is iron ore fines, mainly pellet feed and iron ore concentrates, such fines not being suitable for sintering or direct use in the blast furnace (BF) or

[1] Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of substances and mixtures.
[2] The term 'crystalline silica' covers quartz, cristobalite and tridymite.
[3] Industrial Minerals Association
[4] Specific Target Organ Systemic Toxicant (Repeated Exposure) Category 1.

direct reduction (DR) plant due to their small particle size and the consequent negative effect on sinter plant, BF or DR plant burden permeability.

Such iron ore fines are therefore agglomerated by balling into *green pellets* 8 - 20 mm or larger in diameter in drums or discs in the presence of moisture and suitable binders and additives (such as bentonite, lime, etc.). These *green pellets* are subsequently *hardened* by firing or indurating at temperatures of 1200-1350°C in order to be able to withstand handling and transport as well the weight of the BF and DR plant burden.

The iron ore feedstock and additives used to manufacture iron oxide pellets contain small amounts of crystalline silica - hereafter referred to as "CS". In the course of the pellet manufacturing process, the majority of the CS will stay crystalline; however all CS-particles will be bound within the pellet through bonding of the particles during the green ball stage and sintering during the induration stage. The result is a pellet with no free RCS.

The amount of CS in iron oxide pellets varies from about 0,5% (w/w) up to about 6% (w/w). This range was derived from tests carried out by Vale and Corus on a set of representative samples of different pellet types.

Due to abrasion of the iron oxide pellets during handling and transport, the extent of which is related to the hardness and strength of the pellets, there may be generation of respirable dust containing CS.

Pellet dust was also examined in the above-mentioned tests. Studied were the CS-percentage and the respirable fraction in the pellet dust (< 60 µm) from two different pellets in the range. One was the pellet with the highest CS content in the range. The other is known to be the "softest" pellet in the range, where different abrasion behaviour can be expected.

The measured CS content in the pellet dust (< 60 µm) (**A**) was in both cases higher then the CS content in the pellet itself, about 7% and 4% respectively.

The amount of respirable dust (< 10µm) (**B**) was in both cases about 12% of the pellet dust.

The amount of dust (< 60 µm) in pellets (**C**) has not been measured. Commercial specifications from several pellet suppliers show that the content of fine material below 5mm can be up to 5%. The percentage of material < 60 µm will be a fraction of this, but in the absence of better data the upper specification limit of 5% will be used.

The percentage RCS for Iron Oxide Pellets can be calculated: RCS-% = A x B x C. The highest calculated RSC content for both pellets is therefore 7% x 12% x 5% = 0.042%.

Experience shows that in practice no values for A, B or C will be found resulting in a RCS content in Iron Oxide Pellets above 0.1%.

Pellet Screenings

Undersize pellets, chips and fines are screened off prior to delivery to customers, for example during ship loading. These "screenings" are sold to steel companies and used as feedstock for sinter plants. Analyses show that the amount of respirable dust (< 10µm) in these screenings is about 4%. With a worst case silica content of 7%, the RCS content will be 4% x 7% = 0,28%. As pellet screenings (also referred to as pellet chips or pellet fines) contain relatively a lot of small particles, it can be seen as the worst case for RCS content.

Conclusion

The RCS content in iron oxide pellets (including its dust) will not exceed 0,1% (w/w), which is well below the classification threshold of 1%. The RCS content in pellet screenings as the worst case scenario will not exceed 1% (w/w). Therefore no classification of iron oxide pellets or pellet screenings is needed.