European Insulation Manufacturers Association

Mineral Wool Products and Chromium(VI) Residues

1. Introduction

Eurima was established in 1959 and represents European Mineral Wool Insulation Manufacturers. The purpose of this information sheet is to answer questions on the occurrence of Hexavalent Chromium (or Cr(VI)) on stainless steel appliances and their insulation materials in high temperature environments. Stainless steel does not naturally contain hexavalent chromium. However, hexavalent chromium can be formed when stainless steel is exposed to high temperatures and humidity. Technical mineral wool insulation, which is often used in industrial environments, is not the source of Chromium (incl. Cr(VI)) in these environments.

This information sheet provides additional information on Hexavalent Chromium, its formation in high temperature environments and points to further resources for information and risk management for industrial users.

2. What is Hexavalent Chromium and what is the problem?

Hexavalent chromium or Cr(VI) (i.e. oxidation level +6) is an oxidized chromium species.1

Cr(VI) has been found on gas turbines or stainless steel appliances operated in similar hot processes. The causes and mechanisms of the formation of these compounds are not fully understood by the scientific community. At high temperatures, the reaction between Cr(III) (e.g. Cr2O3 from the steel passivation layer) and oxygen (and water vapour) is known to result in stable Cr(VI) compounds (i.e. Cr(OH)2O2 and CrO3).[2,3,4]

As these Cr(VI) compounds are volatile, their movement through the air and within insulation systems in close proximity to the hot stainless steel appliances, cannot be ruled out. Similarly, physio-sorption and condensation processes of volatile Cr(VI) compounds on surrounding materials have been reported in literature.[5,6]

Clarifications on the source of residues found in hot process environments can be found on the information sheet provided by ECFIA. ECFIA represents the European High Temperature Insulation Wool (HTIW) industry.

3. What is the link with Mineral Wool Insulation

[1] In the EU, Cr(VI) is classified as genotoxic (Muta. 1B) and as carcinogen (Carc. 1B or 1A) under Regulation (EC) No 1272/2008. Dermal exposure to Cr(VI) compounds can also cause skin irritation, ulceration, sensitization, and allergic contact dermatitis.
These classifications are relevant for manufacturers of Cr(VI) who need to inform users of this substances via appropriate labels, warnings and conditions of use. Because of these classifications, certain uses of Cr(VI) are also restricted in the EU under the REACH Regulation such as in cement mixtures, in leather articles and in toys. Uses in electroplating are also subject to authorisation and are likely to be soon also subject to restrictions.
[2] Opila, E. J., Myers, D. L., Jacobson, N. S., Nielsen, I. M., Johnson, D. F., Olminsky, J. K., & Allendorf, M. D. (2007). Theoretical and experimental investigation of the thermochemistry of CrO2 (OH) 2 (g). The Journal of Physical Chemistry A, 111(10), 1971-1980.
[3] Asteman, H., Svensson, J. E., Johansson, L. G., & Norell, M. (1999). Indication of chromium oxide hydroxide evaporation during oxidation of 304L at 873 K in the presence of 10% water vapor. Oxidation of Metals, 52(1), 95-111.
[4] Sand, T., Geers, C., Cao, Y., Svensson, J. E., & Johansson, L. G. (2019). Effective reduction of chromium-oxy-hydroxide evaporation from Ni-base alloy 690. Oxidation of Metals, 92(3), 259-279.
[5] Key, C., Eziashi, J., Froitzheim, J., Amendola, R., Smith, R., & Gannon, P. (2014). Methods to quantify reactive chromium vaporization from solid oxide fuel cell interconnects. Journal of The Electrochemical Society, 161(9), C373.
[6] Tatar, G., Gannon, P., Swain, N., Mason, R., Remington, E., & Dansereau, S. (2018). XPS Characterization of Aluminosilicate Fibers Post Interaction with Chromium Oxyhydroxide at 100-230 C. Journal of The Electrochemical Society, 165(10), C624.

Mineral wool insulation has been mentioned as a possible contributing factor to the formation of Cr(VI) from stainless steels in hot environments. It is true that Mineral Wool insulation is often used in close proximity of Chromium-containing stainless steel to provide the necessary insulation of hot process machines.

Mineral wool is made from different raw materials, which are melted to manufacture glass (also known as a vitreous silica network) which is then transformed into fibres. Mineral wool contains alkali and alkaline earth metals. However, these elements are firmly integrated within the fibres glass network. This means that they are not generally available to potential chemical reactions.

Mineral Wool insulation itself is not a source of chromium (including Cr(VI)).

4. Conclusions

Cr(VI) is not used in Mineral Wool products and exposure to Cr(VI) is most likely to occur in hot and humid industrial environments where stainless steel is used.

Industrial workers in hot environments, working around stainless steel equipment, should follow the appropriate risk management measures regarding Cr(VI). This includes workers handling any technical insulation which had been used around stainless steel appliances in such hot processes, for example during renovation or dismantling.

During the installation of new technical insulation, there is no reason for concern about the exposure to Cr(VI) from the new insulation products. However, if the stainless steel equipment has been operated at high temperatures in the past, its surfaces should be examined for traces of Cr(VI) compounds.
As described above, this document is relevant for high temperature industrial environments and it is not related to common building insulation (walls, roof, floors etc.). Please refer specific questions on the Cr(VI) formation to the stainless steel manufacturer.

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