SmiTools - Free formaldehyde

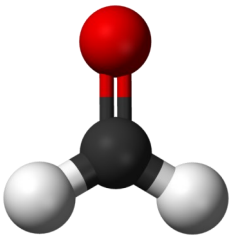
avoid leather rejections because of formaldehyde

In this SmiTools Smit & zoon is sharing a synopsis on the topic 'Free formaldehyde'. Learn about the different ways to origin of the chemical, producing formaldehyde free leathers, releasable formaldehyde, testing leather chemicals (ISO 27587) and leather (ISO 17226-1 or VDA 275) on free formaldehyde, etc..

Formaldehyde: a tool and a challenge for the leather industry

Regulations about the use and release of formaldehyde are becoming bigger challenges for the leather industry every year. Formaldehyde chemistry is interesting but also complicated. This makes communication about this topic between commercial and technical professionals somewhat difficult. Many misunderstandings do exist, sometimes leading to wrong choices. In this white paper we try to give an overview that requires only a basic understanding of chemistry, but is complete and scientifically correct. It is our objective to simplify communication about this topic .

Formaldehyde: a versatile chemical tool in nature and industry



Formaldehyde is a naturally occurring substance, which is produced and used in every living cell of plants, animals and humans. The molecular formula is CH_2O. In its pure form at ambient conditions, it is a gas with a strong, pungent smell. Formaldehyde is highly soluble in water and usually supplied as the aqueous product that we call formalin (37 – 55%).

Formaldehyde is not only readily found in nature, but is also a versatile chemical when manufactured synthetically. The base material is produced from natural gas, via methanol and used as a building block for many polymers & chemical products. It plays an important role in the production of household products, floor panels, furniture, fabrics, shoes, paper, pharmaceuticals, disinfectants, glues, paints, coatings and many other materials.

Formaldehyde: handle with care

At the high concentrations that can occur in the chemical industry & laboratories, formaldehyde is an irritating, reactive, toxic and flammable chemical, that should be handled with due care in a professional way. Formaldehyde is broken down by sunlight and bacteria within a few hours and is quickly decomposed in living cells. This is why formaldehyde never accumulates in the human body or in the environment. Formaldehyde can cause allergic reactions.

Some studies have indicated that there might be a risk of developing a rare form of nose cancer, when exposed to high concentrations over a long period. Although the results of these studies are disputed, some institutions and countries have classified formaldehyde as carcinogenic in both high (IARC) & low (EU) classes. Strange as it may seem, these classifications led, in some cases, to standards for exposure levels or concentrations in products that are even below the natural concentration in an apple (20 mg/kg). Although the disputes about these limits and the data behind them still continue, the industry has to make all possible efforts to achieve them.

Formaldehyde: both needed and unwanted in leather

As in other industries, formaldehyde is used as an essential raw material in the manufacture of many leather chemicals. Examples are biocides, syntans, resins, dyeing auxiliaries, fatliquors and finishing products. Under the influence of temperature and humidity, these substances can partly be broken down into their components by a process called hydrolysis. During the hydrolysis of these chemicals in leather, formaldehyde is released . The conditions inside shoes during wear are particularly favourable for the hydrolysis process. This is one of the reasons that leather with low formaldehyde release is a major issue for many shoe manufacturers.

Production of low formaldehyde releasing leather: a real challenge

The production of leather that releases low levels of formaldehyde starts with a careful choice of base materials and leather chemicals. It will be evident that low formaldehyde chemicals will not recover the situation if the hide, wet blue or crust already contains chemicals with a high formaldehyde release potential, like certain preservatives.

At this point it is essential to understand the difference between the free formaldehyde content and the formaldehyde release potential of chemicals. The free formaldehyde content is the level of formaldehyde gas dissolved in, or weakly bound to, a chemical or a leather. The formaldehyde release potential is the ability of a chemical to produce formaldehyde while falling apart by hydrolysis. The formaldehyde release characteristic of leather is mainly dominated by this potential and to a lesser extent by the free formaldehyde content of the chemical itself. The formaldehyde release potentials and the free formaldehyde contents of leather chemicals differ widely. It is essential to make the right selection in the whole recipe from beam house through to finishing. The choice of a chemical with some formaldehyde release potential is not necessarily a problem, as long as other chemicals in the recipe have low potentials.

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The selection of chemicals with low formaldehyde release potential

Many chemical products do not contain formaldehyde, are not produced with formaldehyde and cannot possibly develop formaldehyde in leather. It can easily be concluded that this is the case from a basic knowledge of their chemical composition.

For chemicals that are not obviously part of this category, the assessment of their formaldehyde release potential is less easy. The behaviour of a chemical in leather can be measured in no other way than in the leather itself. This means that several test pieces of leather have to be produced with different chemicals and/or concentrations. Using officially approved test methods, the formaldehyde release characteristics of the leather can be measured and compared with the relevant standards.

Testing for formaldehyde in leather

It is essential to choose the most appropriate test method. The method must be followed very precisely; otherwise the results will be meaningless and will lead to wrong choices and decisions. Several test methods for formaldehyde in leather are widely used. Some of which were developed for textiles and thus result if flaw results when applied on leather or leather chemicals. Examples are EN -ISO 14184 and Japan Law 112. In 2008, a new test method for formaldehyde in leather was published as an official international ISO Standard. This new ISO 17226 Standard specifies two methods for the determination of free and released formaldehyde in leather. We strongly recommend that ISO 17226-1 (DIN 53315-B) should be the only method used for testing formaldehyde in leathers. For automotive upholstery leathers, individual automobile manufacturers' specifications & standards, like VDA 275, have to be used.

Testing for formaldehyde in leather chemicals

Despite the explanation above, it is very understandable that tanners still have a desire to test a leather chemical in its pure form. There is a way to do this, but due care is necessary before turning to it, and even greater care in attempting to translate the results. It is not unlike predicting what the taste and texture of a cake will be by tasting the raw ingredients. In the case of formaldehyde in leather chemicals many mistakes are made and wrong conclusions drawn, even by reputable companies. The greatest and most common mistake is to adopt test methods originally developed for leather or textiles in the testing of leather chemicals. If you want a meaningful result, there is only one suitable method currently available. This method was developed by the leather institute LGR in Reutlingen, Germany and adopted by the International Union of Leather Technologists and Chemists Societies (IULTCS). The official ISO standard is know under the name: IUC 26 or ISO 27587 Leather - Chemical tests - Determination of the free formaldehyde in process auxiliaries. It must be stressed that with this test method only the free formaldehyde content of a chemical can be measured. The formaldehyde release potential of the chemical is not measured by this technique. It is only by testing leather, not the leather chemical, that the full answer can be achieved.

Contact Smit & zoon for further information

The information given in this SmiTools is just a synopsis on the topic. We would be glad to help you further in case of questions, the sharing of information or help with choosing the right wet-end products for your application. Please feel to contact your usual relations within Smit & zoon.

Contact details

Smit & zoon

E-mail : infor@smitzoon.com

Website : : http://www.smitwet-end.com

Phone : 0031 294 238 800