
Safety Precautions when working with Hydrogen Peroxide



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The dangers of hydrogen peroxide

The commercially available solutions of H₂O₂ up to 85 weight % are stabilised, and when handled correctly have a minimal tendency to decompose. Heat, light, heavy metals or their compounds (e.g. rust), non-ferrous metals, such as brass, etc., alkalis and all types of impurity will however accelerate this process in some cases to a considerable degree.

Dilution may only be made using distilled water, since in many cases it is not possible to maintain stable solutions using tap water. Even so, re-stabilisation may still be necessary.

Within certain mixing proportions, high-percentage H₂O₂ solutions with organic liquids may have explosive properties. Moreover it should not be forgotten that when H₂O₂ decomposes, the result is the concentration of oxygen which together with the vapours of organic compounds can form ignitable mixtures. If in doubt, please always ask the manufacturer. In the presence of heavy metals or their compounds, H₂O₂ solutions will decompose extremely rapidly - in extreme cases explosively - as gases and heat are produced.

Hydrogen peroxide and its watery solutions are themselves not inflammable. However, a spontaneous fire may result when H₂O₂ solutions above 30% come into contact with oxidisable organic substances. Cotton wool, wood, straw, paper, oil, coal, fabric etc. should therefore not be brought into contact with this type of solution.

Fire should be extinguished with water. There is no risk to the sewage or ground water.

Hydrogen peroxide solutions - in particular in high concentrations - have a noxious effect on the body tissue. When working with H₂O₂ avoid all contact with the skin, the mucous membranes and eyes. Protective gloves, close-fitting safety goggles and protective clothing made of H₂O₂-resistant material, such as neoprene, should always be worn.

Parts of the body wetted with hydrogen peroxide should be rinsed thoroughly with water, especially if the eyes are affected.

When H₂O₂ is swallowed, drink a large amount of lukewarm water. When H₂O₂ comes into contact with the eyes or stomach, or when H₂O₂ vapours or mists which may result from decomposition are breathed in, a doctor should be sent for immediately.

Storage and handling, storage tank installations

H₂O₂ should only be stored in original containers supplied by the manufacturer together with the corresponding original seals. Once the goods have been removed, they may on no account be returned to the containers. They may only be removed from the containers by careful pouring or with the aid of suitable equipment (e.g. barrel pump made of PE etc. or flux pump made of VA); these may only be used for H₂O₂, and a check should be made before they are used that they are absolutely clean. Dirty small containers should be removed; if in doubt contact the manufacturer. Only officially authorised small containers should be used; their caps should have valves which prevent leaks, but which allow gas to escape. No other substances may be stored in containers used for H₂O₂ solutions.

H₂O₂ should be transported in road tankers, railway cisterns or tank containers, since the risk involved in handling is low compared with small containers (risk of impurification during filling and draining, containers mixed up, incorrect storing). When filling the tank installation from the cistern, only the specially installed pump should be used. Supplies in road containers may only be transferred via the container assemblies. Care should be taken that the transport containers are completely empty.

Containers may be horizontal or vertical. We recommend fully emptying the containers from time to time, in order to prevent impurities collecting.

Tank installations should be set up by the H₂O₂ manufacturer. If installed by anyone else, they must be checked by the H₂O₂ manufacturer before initial filling. When setting up the containers, care should be taken that access is denied to all impurities, and that there are no pipeline connections to other tanks containing chemicals. The equipment should be protected against the effects of heat and the risk of mechanical damage.

Vertical containers should be equipped with loose-fitting lids, which in the case of large containers may comprise a number of segments. The lid area on the top of horizontal containers should be as large as their mechanical resistance permits.

Equipment for measuring the temperature and level, observation holes and flooding pipes should be provided for all containers.

Any iron-free AI 99.5, stainless steel (e.g. material No. 1.4571) or plastics (today normally PE, PP; PVC) may be used. Aluminium can be used for all concentrations, since no decomposition catalysts from the container walls can penetrate the product. For concentrations above 50 weight % only aluminium or stainless steel should be used.

Metal containers must be pickled and passivated before use.

Check that the weld seams on the container are perfect (no cavities). Any mechanical treatment necessary (brushing, grinding, polishing) should be carried out before pickling and passivating.

(Regulations for setting up and handling the tanks are obtainable from the H₂O₂ manufacturer).

Pipelines should be installed in a way that no liquid pockets can form. They should provide a free outlet to the receiving container. It should not be possible for H₂O₂ to flow back into the storage tank. Valves should be mounted in a way that the inclusion of H₂O₂ is not possible. If this is unavoidable, rupture discs should be used.

The same conditions apply to the pipeline material and treatment of its surface as to the containers. The sealing materials which can be used are Teflon, Viton and soft PVC; for concentrations above 50 weight % only Teflon or Viton should be used.

Care should be taken with all pipeline connections that there is no electrically conducting contact between different types of stainless steel or, moreover, between stainless steel and aluminium (not even via a flange or screws).

Hydrogen peroxide is normally supplied via specially installed centrifugal pumps made of stainless steel with, for example, a Teflon/ceramic slip ring seal. Care should be taken that the pumps do not operate against closed valves in order to prevent them heating up. It is not permitted to supply other chemicals with these pumps. The connections for the inlet and outlet lines should be clearly marked, protected against dirt and checked regularly to see that they are absolutely clean. Connections, valves and switching equipment should be safeguarded in a way that excludes startup by accident or by unauthorised persons.

This type of draining is not to be recommended, since it requires closed containers. If it is used nevertheless, pressure or vacuum lines and containers made of stainless steel should be used, and the supply medium should be free from rust and oil. Moreover a special pressure generating system should be installed for supplying the H₂O₂.

Suitable shutoff elements are valves and taps made of stainless steel with insets in stainless steel or plastic (PCV, PE, PP, Polyester).

The H₂O₂ containers and the associated valves and lines should be inspected regularly. It may be necessary to clean them and passivate them again. The stability test (decomposition value) performed on an H₂O₂ sample from a full tank is a suitable final check for the container interiors. (The decomposition value will be readily supplied by the manufacturer on request). Repairs and modifications to the tank installations should not be performed without authorisation from the manufacturer.

The greatest caution should be taken and cleanliness maintained during all operations with H₂O₂ and the specially installed equipment.

Official Regulations

Only containers with an approved design (e.g. polyethylene canisters for H₂O₂ concentrations up to 60 weight % or pure aluminium drums) are permitted as small containers, or railway or road tankers and containers made of pure aluminium or stainless steel. They must all be marked with the C danger symbol, and if they have more than 60 weight % H₂O₂ with the O danger symbol in addition.

The legally valid "Decrees on dangerous working substances" also apply. We should also like to mention the "Note on working with hydrogen peroxide" published by the employer's liability insurance association, as well as our brochure on "Hydrogen peroxide" and the "Hydrogen peroxide" safety notice, which should be mounted in the store and at the points where H₂O₂ is used.

During transport the legally valid national (and international) regulations in accordance with Annex C of the GGVE (RID), GGVStr (ADR) and GGVSee (IMDG Code) should be observed.

Final Remarks

The information here lays no claims to completeness, but is intended to make clear the care which is desirable when working with hydrogen peroxide. However, in view of the applications for H₂O₂, many of which are unknown to the manufacturer, we really are unable to accept any kind of guarantee.

Each user must therefore accept the responsibility for weighing up, checking and if necessary supplementing the required safety precautions in accordance with his own particular needs and operating circumstances.

All information given is correct to the best of our knowledge, but lays no claims to completeness and does not absolve the user from performing his own checks.

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