

Safe Storage and handling of Hydrogen peroxide Aug 2017

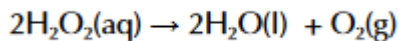
Chemical Properties

Hydrogen Peroxide (H₂O₂) is a predictable and safe liquid chemical when its properties are known and the correct safety procedures and protective equipment is used. Concentrated liquid H₂O₂ is commercially available with either 30% or 50% active ingredient.

H₂O₂ is a very strong oxidising agent. This makes it an excellent irrigation sanitizing agent. It works much like chlorine in that it reacts with organic matter- including killing biological organisms. H₂O₂ will not remove iron or manganese from irrigation lines. Other products such as acids are required for that task.

The decomposition reaction requires a catalyst (reaction agent) to start the reaction. In irrigation water the catalysts commonly found are organic matter, biological organisms and dissolved metals such as iron or manganese.

The reaction creates only water + oxygen.



It is the actual decomposition reaction that is the sanitizing action. The rate of the decomposition reaction is dependent on:

1. The concentration of H₂O₂ injected,
2. The type of reactive compounds/ organic matter and their concentration in the water,
3. Temperature,
4. Water pH.

Depending on the above variables the duration of the decomposition reaction can be a couple of hours or up to 36 hours. For this reason, we recommend aiming for the longest possible “contact time”. This means the H₂O₂ should be held in the irrigation system for as long as possible to be most effective.

Storage

Commercially available Hydrogen peroxide contains a stabilizing agent that reduces its natural decomposition rate to about 1% per year at 20°C. The natural decomposition rate increases with temperature and exposure to sunlight. Therefore aim to store H₂O₂ below 30°C where possible and out of direct sunlight. Its storage life rapidly decreases at temperatures >35°C.

A decomposition reaction of a large volume of concentrated H₂O₂ is dangerous. It can be very fast and generate considerable heat. If the container does not vent then an explosion could result. Eg, This would occur if an unused H₂O₂/ water solution was poured back into the storage drum of concentrated H₂O₂. Never return diluted and unused H₂O₂ back into the storage container containing pure H₂O₂.

Rapid uncontrolled decomposition reactions of large volumes can also produce dangerous H₂O₂ steam. Such vapours are very damaging to lungs. For this reason H₂O₂ should be stored and handled in a ventilated sheds/ spaces.



Since H_2O_2 starts decomposing as soon as it is mixed with any water, it can not be diluted with water and then stored for any time. It can only be stored as pure H_2O_2 in its original container.

Concentrated H_2O_2 can ignite organic materials on contact- therefore never store concentrated H_2O_2 containers on wooden pallets or cardboard- these may ignite if a spill of concentrated H_2O_2 occurs.

H_2O_2 is much more stable than chlorine during storage. FYI- Chloride tends to degrade at approx. 10% per month.

Safe handling

Concentrated H_2O_2 requires respect, similar to concentrated chlorine or other strongly corrosive or acidic chemicals. However, once H_2O_2 is diluted down to the rate used in irrigation systems there is little hazard.

Never add concentrated H_2O_2 to other chemicals. Always dilute the H_2O_2 prior to mixing with other chemicals.

Always wear rubber gloves (not nitrile). Never wear leather gloves when handling concentrated H_2O_2 - the gloves may ignite if wet by H_2O_2 .

Always wear face protection against splash hazards when pouring concentrated H_2O_2 . Concentrated H_2O_2 can cause serious eye injuries. If eye splash occurs then immediately wash eyes with large volumes of water. Seek urgent medical assistance.

Wash skin with water immediately if H_2O_2 contact occurs. Temporary skin bleaching can occur from diluted H_2O_2 and skin burns can occur from concentrated H_2O_2 .

Never wipe up concentrated spills of H_2O_2 with a cloth rag. The rag may ignite due to the heat generated. Wash spills away with water- use at least 10x the volume water of H_2O_2 spilled.

Training

For a comprehensive 25 minute training video on hydrogen peroxide, and its safe storage and handling, I recommend you visit Evonik's weblink:

<http://h2o2.evonik.com/product/h2o2/en/services/Pages/h2O2-safety-training-video.aspx>

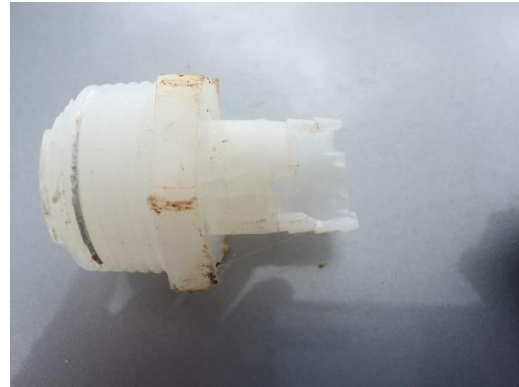
Material compatibility

Concentrated H₂O₂ will corrode and destroy some metals and polymer plastics.

Use only Polyethylene (PE) fittings only such as Netafim or Hansen. Polypropylene (Philmac) or Nylon fittings will be slowly destroyed. Use high quality pink thread sealing tape.



Philmac (PP) tank fitting failure in 50% hydrogen peroxide



Nylon fitting failure in 50% hydrogen peroxide

Material compatibility:

Material	< 10% H ₂ O ₂	30% H ₂ O ₂	50% H ₂ O ₂
HDPE	✓	✓	✓
LDPE	✓	✗	✗
PVC	✓	✓	✓
Polypropylene (PE)	✓	✗	✗
Teflon (PTFE)	✓	✓	✓
Silicon	✓	✗	✗
Viton	✓	✓	✓
Nylon	✗	✗	✗
Copper	✗	✗	✗
Aluminium	✓	✓	✓
Brass/ Bronze	✗	✗	✗
Cast iron	✗	✗	✗
Galvanised	✗	✗	✗
Stainless steel	?	?	?

? = the many grades of stainless steel each have different compatibilities with varying concentrations of hydrogen peroxide. Carefully check compatibility before use.