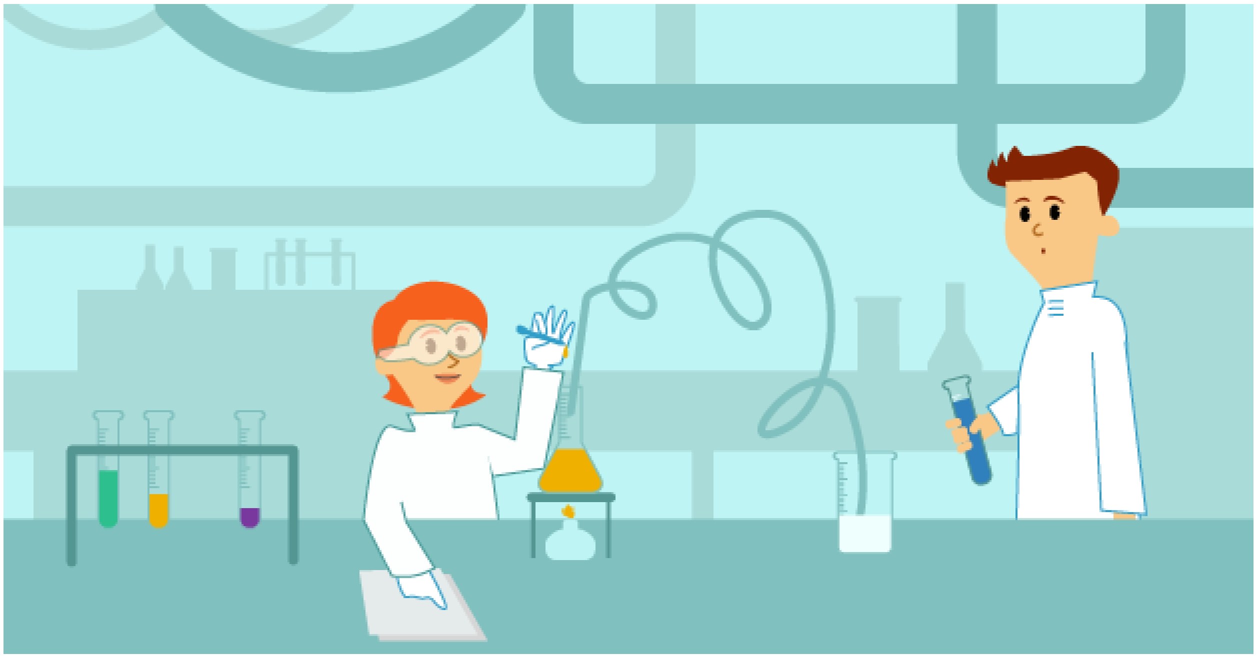
PURIFICATION AND CONCENTRATION OF HYDROGEN PEROXIDE



Concentration

In most applications outside the propulsion field, only dilute solutions of hydrogen peroxide are required and the product grades normally obtained from the conventional commercial processes are adequate. To meet the demands of propellant-grade hydrogen peroxide, additional concentration is required. Although hydrogen peroxide is normally concentrated commercially by fractional distillation to concentrations < 90 w/o H_2O_2, other concentration procedures, such as fractional crystallization combined with vacuum distillation, have been frequently used for small-scale purification. The concentration of the 90 w/o H_2O_2 solutions to ~98 w/o H_2O_2 is presently being accomplished commercially (Ref. 2) by fractional crystallization. This crystallization process also removes most of the impurities.

The high volatility of water with respect to hydrogen peroxide makes it relatively easy to concentrate peroxide by simple distillation procedures; however, there are several disadvantages to this technique. Concentration of the nonvolatile impurities, which occurs in the hydrogen peroxide during distillation, decreases the stability of the product. In addition, the rate of decomposition increases with temperature rise (2.3 times for each

10 C rise in temperature). Finally, hydrogen peroxide vapors which are in excess of 26 m/o H_2O_2 are explosive.

Purification

For some purposes, a relatively high impurity and stabilizer content may be innocuous and a lower stability acceptable; however, for most propellant applications it is essential that the impurities be removed or kept to a minimum. This is particularly true when concentrations of 80 w/o or more are desired. High purities in the propellant-grade solutions are obtained by a multiple-stage distillation process in which the hydrogen peroxide is completely vaporized in the first stage, leaving only the nonvolatile impurities. A vacuum distillation is usually performed (Ref. 1) to keep the temperature (and subsequently, the decomposition) to a minimum. This technique also decreases the potential explosion hazard.

Theoretically, the removal of impurities by distillation or fractional crystallization should be complete except for impurity pickup from the apparatus itself in either the final process condenser or receiver. However, because of the catalytic impurities acquired during the handling and storage operations, a stannate stabilizer is usually employed in small concentrations to buffer the effects of these impurities. However, the gradual drop out of this stabilizer during storage results in additional emphasis on the importance of impurity removal from hydrogen peroxide solutions.

Although ionic impurities may be removed by applying an electric potential, the use of ion-exchange resins may prove to be a more practical means of purification because this method could be applied easily at the point of final use to remove contamination acquired during transfer operations as well as residual manufacturing impurities. Extensive experimental studies in this area (Ref. 3) have indicated that stannic acid seems the most likely choice for an ion-exchange media.

Source : http://www.diyspaceexploration.com/purification-concentration-hydrogen-peroxide/