GENERAL IDENTIFICATION OF HYDROGEN PEROXIDE

The physical classifications under general identification are those properties that are used to identify hydrogen peroxide and its physical state.

Molecular Weight of Hydrogen Peroxide

The molecular weight of hydrogen peroxide was experimentally determined by freezing point depression (Ref. 2.1 and 2.2) and vapor density (Ref. 2.3) measurements. The results of these studies are comparable to the value of 34.016 calculated from the International Atomic Weights. The mole percent and apparent molecular weight as a function of weight percent H_2O_2 for various aqueous solutions of H_2O_2, as shown in Fig. 2.1, were calculated from the molecular weights of H_2O and H_2O_2 based on the International Atomic Weights.

Freezing Point Hydrogen Peroxide

The determination of freezing and melting points of H_2O_2-H_2O solutions is relatively difficult because of the large degree of supercooling possible with these solutions. In addition, phase equilibrium measurements (Ref. 2.2) have indicated that solid solutions are not formed in the solidification of concentrated (greater than 65 w/o H_2O_2) aqueous solutions of H_2O_2; instead, the solid consists of crystals of H_2O_2 with occluded mother liquid. Thus, the range of temperatures over which the material melts or freezes is a function of the crystallization pattern of the H_2O_2. The freezing point of “100 percent” H_2O_2 has been reported as -0.61 c (31.17 F), -0.43 C (31.23 F),and -0.41 C (31.26 F) in Ref. 2.2, 2.4, and 2.5, respectively. Based on a reported sample purity of 99.97 m/o H_2O_2, the freezing point determination of Ref. 2.4 was selected as representative of 100 percent H_2O_2 . Measurements of the freezing points of aqueous solutions of H_2O_2 (Ref. 2.2) indicate eutectics at 45.2 w/o H_2O_2 and -52.4 C (-62.3 F), and at 61.2 w/o H_2O_2 and -56.5 C (-69.7 F). The results of these measurements, which are graphically illustrated in Fig. 2.2 and 2.2a, represent the temperatures at which 20 to 30 percent of th liquid had

solidified. Experimental melting point studies (Ref. 2.6), based on observation of the temperature at which melting was complete, resulted in slightly higher melting temperatures for concentrations above 60 w/o H_2O_2.

A variety of experimental studies have produced no significantly effective freezing point depressants for propellant-grade H_2O_2 solutions. These studies, described in detail in Ref. 2.3 and 2.6 through 2.9, have shown that many additives will form, unstable or shock-sensitive mixtures with H_2O_2.

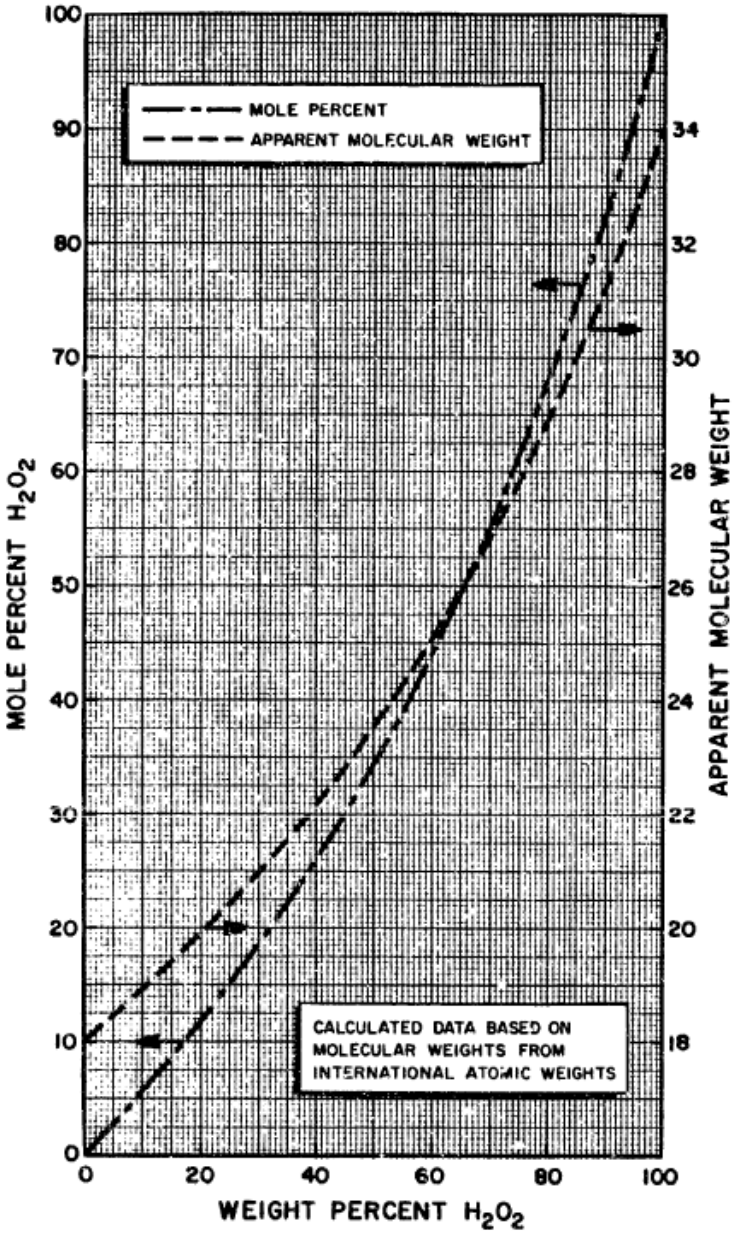

Figure 2.1. Concentration and Apparent Molecular Weight of Aqueous Hydrogen Peroxide Solutions

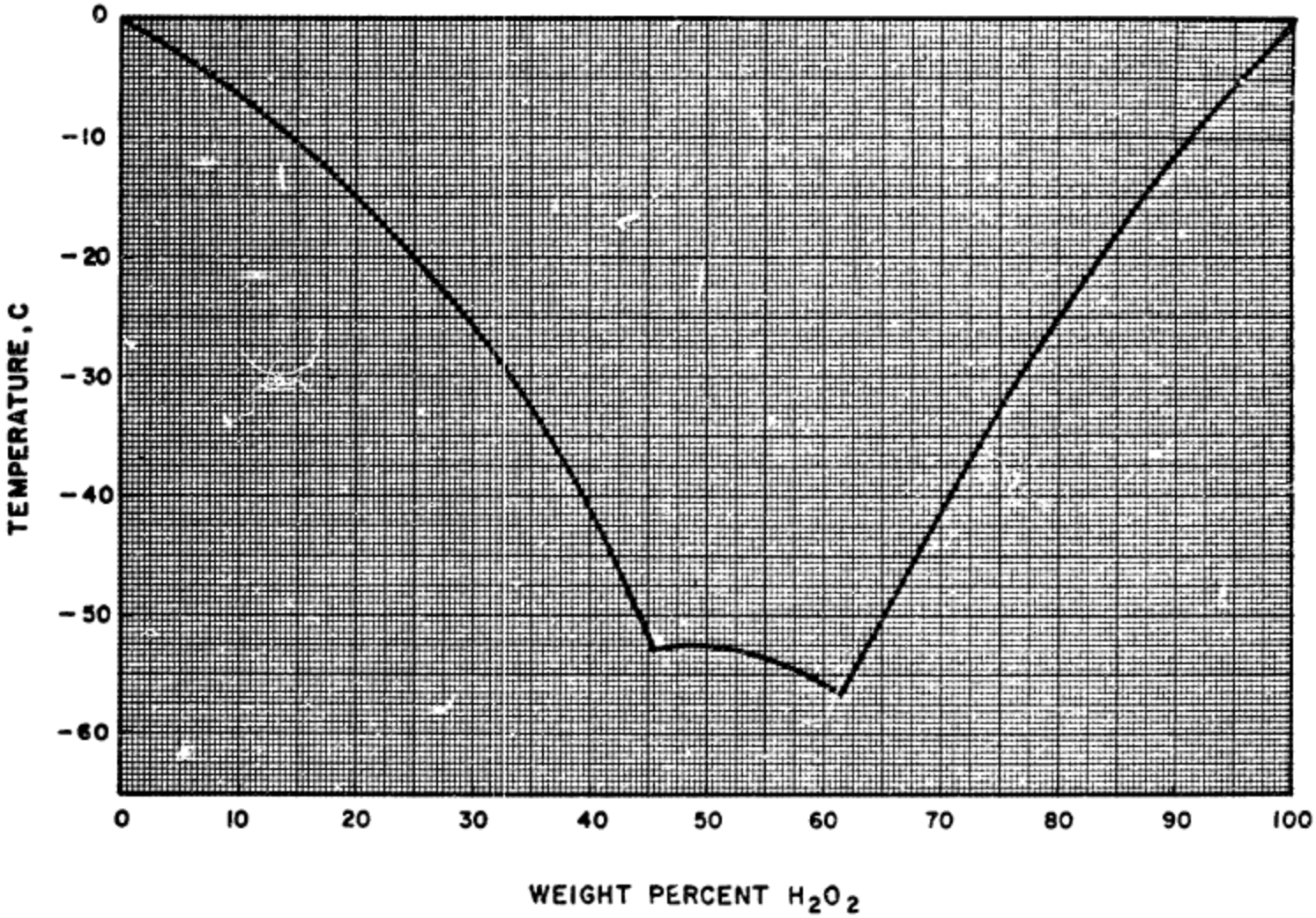

Figure 2.2. Freezing Points of Hydrogen Peroxide-Water Solutions (Ref. 2.2)

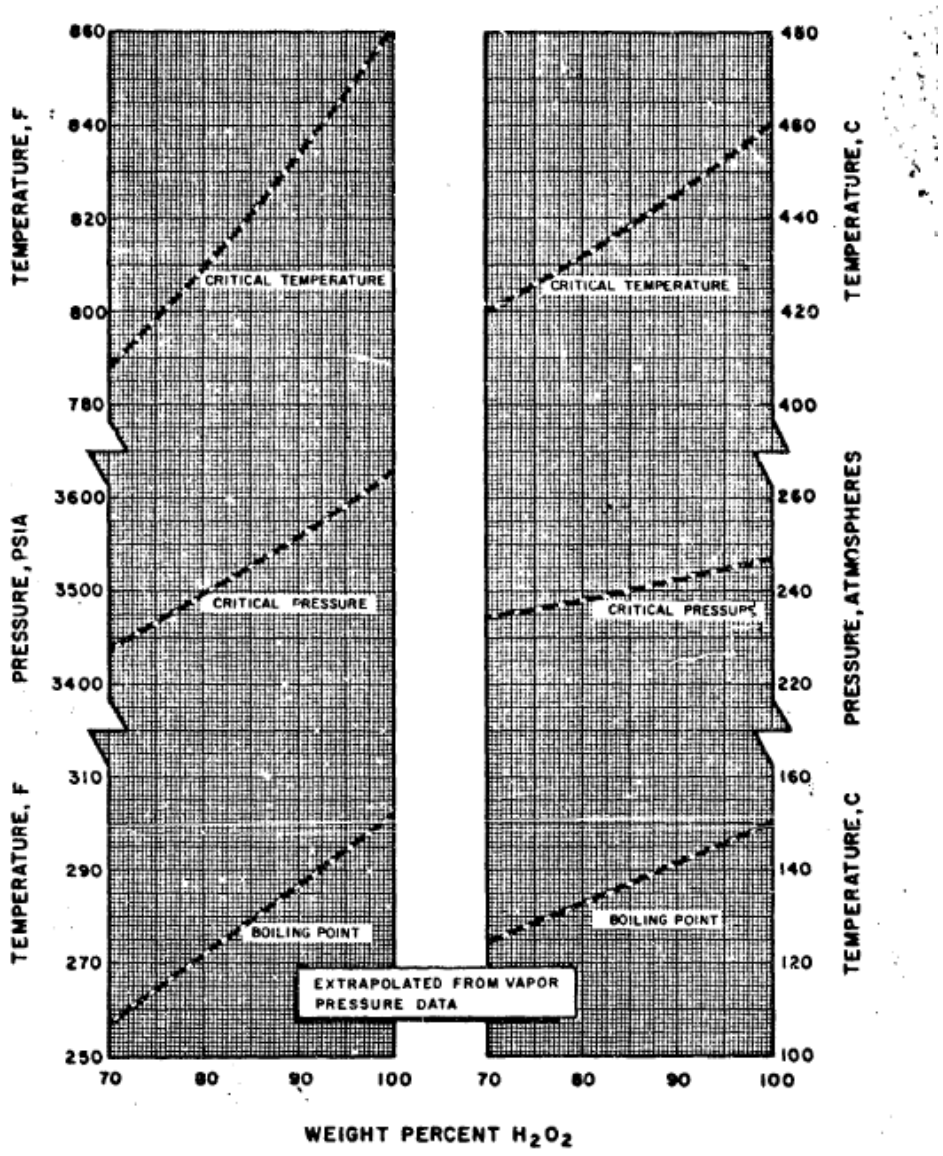

Figure 2.3. Critical Temperature, Critical Pressure, and Boiling Point of Propellant-Grade Hydrogen Peroxide-Water Solutions

Triple Point of Hydrogen Peroxide

The triple point of 99.97 m/o H_2O_2 was estimated as 272.74 K (-0.42 C or 31.24 F) from experimental heat of fusion studies (Ref. 2.5). Although no vapor pressure measurements have been made on solid H_2O_2, the vapor pressure at the triple point has been calculated (Ref. 2.10) as 0.26 mm 1g (0.005 psia).

Source : http://www.diyspaceexploration.com/general-identification-of-hydrogen-peroxide/