

Detailed Hydrogen Peroxide Information

Price per Kg 8/2/2015

90% 7.05 euro £5.20

85% 5.87 euro £4.36

80% 5.17 euro £3.84

Hydrogen peroxide has the chemical formula H_2O_2 . It is a clear colorless liquid and has a slight smell of chlorine.

The world consumption of H_2O_2 is well over 2 Mton/annum. A big part of it is used for bleaching wood pulp and textiles. The concentration, when used for such applications is typically in the range of 35 to 60%.

Propellant grade hydrogen peroxide, also known as *Rocket grade hydrogen peroxide* or *HTP* (High Test Peroxide) has a much lower consumption, but is gaining popularity. The concentration is at least 70%. Most commonly 85 to 90%. The reason is that the heat of decomposition will not be high enough to evaporate all water present, if the concentration is any lower.

Propellant grade H_2O_2 needs to be very pure to be stable enough for handling, transport and storage and to prevent poisoning of the decomposition catalyst. Phosphate ions are one of the strongest catalyst poisons. (A well known analogy is that leaded gasoline can not be used in a modern car, because the lead poisons the exhaust gas catalyst.)

PROPERTIES

	P80	P85	P90
Concentration, %	80-81	85-86	89.5-90.5
Density, kg/l at 20 °C	1.34	1.365	1.39
Boiling point, °C	133	137	141
Freezing point, °C	-25	-18	-12
Heat of decomposition, kJ/kg	2320	2460	2600
Heat of evaporation, kJ/kg	-1700	-1650	-1600

PURITY

Analysis of master samples of the production from start-up of the plant in May 2006 to 2008:

Concentration: 85 - 90 %

Stability: 1.6 - 2 %

Impurity	Concentration	Remarks
Al	0.04 mg/kg	
Au	<0.03 mg/kg	1
Cr	<0.05 mg/kg	1
Fe	0.06 mg/kg	
Ni	0.02 mg/kg	
P tot	<0.1 mg/kg	1,2
S	<1 mg/kg	1
Sn	0.8 mg/kg	3
As	<0.3 mg/l	1
Cu	<0.01 mg/l	1
Mg	<0.01 mg/l	1
Pb	<0.05 mg/l	1
Sb	<0.5 mg/l	1
Ti	<0.01 mg/l	1
Zn	0.01 mg/l	
Cl	1.6 mg/l	
NO ₃	3.0 mg/l	
SO ₄	2.0 mg/l	

Remarks:

1. The sign "<" means the substance was not found in the sample, because the concentration of the substance was lower than the detection limit of the analyses method used. The detection limit is the figure after the "<" sign.
2. P tot is the total amount of Phosphorous containing components present in the sample. The analyses include Phosphate, PO₄³⁻ as well as other phosphorous containing compounds.
3. Sn is added to the products, in the form of Sodium Stannate, to improve stability at storage and handling. The doze is low enough to not disturb the catalytic decomposition at propellant applications.

Comments:

The quality of Peroxide Propulsion's products are high and well in accordance with the requirements of [MIL 16005F specification](#). This specification is worked out by NASA and the US Military. It is the result of many years of experience of what constitute a well functioning propellant at long time storage, transport and usage.

ROCKET PERFORMANCE

A 1000 Newton rocket, able to lift 102 kg (= 225 lbs), has been calculated, using this [calculation program](#). The results for P80, P85 and P90 at 20 bar propellant pressure are summarized in the below table:

	P80	P85	P90
Mass flow (=propellant consumption), kg/s	0.904	0.841	0.789
Temp. in catalyst chamber (after decomposition), °C	495	620	745
Nozzle exit temp, °C	87	145	203
Velocity at nozzle exit (atmospheric), m/s	1106	1190	1267
Thrust = Mass flow x Exit velocity, Newton	1000	1000	1000
Nozzle throat diameter, mm	20.9	20.9	20.9
Nozzle exit diameter (atmospheric), mm	37.4	37.4	37.4

It is interesting to note that the nozzle dimensions are identical, for the different propellant concentrations. In other words: *The thrust is the same, regardless what propellant concentration is used, for a given nozzle size!*

The velocity and the mass flow differs for the three qualities, but the mass flow x velocity = thrust, is the same. P90 gives the highest velocity and the lowest mass flow (= lowest propellant consumption). P80 gives the lowest velocity and the highest mass flow (= highest propellant consumption), but is still the lowest cost alternative because of the lower price. It may seem peculiar that a low velocity, (=low volume flow) still gives a high mass flow, but the explanation is that the gas density is higher, for the lower concentrations, because of lower temperature.

Racing Rocket Vehicles

A calculation program to estimate the performance of rocket driven vehicles is found [here](#). Please note that the excel file contains 2 pages! Page 1: Calc. of acceleration, speed and travelled distance. Page 2: Calc. of aerodynamic drag.

Standard Stainless Steel as a Construction Material:

When calculating the needed wall thickness of a catalyst chamber or a nozzle, one start with calculating the needed thickness at room temperature and the actual pressure.

For higher temperatures one need to multiply this wall thickness with a factor.

For 316SS this factor is:

1.3 at P80 = 495 °C: Add 30% to the wall thickness needed at room temperature.

2.5 at P85 = 620 °C: Make the walls 2.5 times as thick as would be needed at room temperature.

> 10 at P90 = 745 °C: 316SS is not a proper steel material for P90.

HAZARDS

The hazards are described in the Safety Data Sheets, [SDS](#).

Hydrogen peroxide is etching but not as bad as an acid or caustic. At skin contact HP will penetrate the skin near to the surface and decompose to water and oxygen just under the skin surface. This makes the skin white and it will ace/burn. These effects are not permanent. After a couple of hours the white color and the ace disappears and the skin goes back to normal again. In any case, even if you will not be permanently hurt, this experience is painful enough for you to always wear rubber gloves when you handle the peroxide. You should also wear glasses to prevent splashing in your eyes.

Propellant grades hydrogen peroxide can NOT explode. What CAN explode are the vapours above boiling hydrogen peroxide, so do not boil the product. Also mixtures with organic solvents, like alcohols or kerosene, are explosive.

Propellant grades hydrogen peroxide can NOT burn. What CAN burn are organic materials soaked with hydrogen peroxide spillage, like dry wood or dry grass, because the HP oxidize these materials.

Propellant grade hydrogen peroxide is stable at storage. The concentration drops typically 1 percent per year, only. If polluted with metal ions or other impurities, decomposition can start, though. The same goes for contact with dirty or un proper surfaces, like silver, copper or carbon steel. Closed storage vessels and pipe sections that can be locked in between valves, should always have a relief valve or a bursting disc.

PACKAGING and TRANSPORT

The products are packed in approved non returnable cross linked HDPE Jerricans (3H1, PG1) with breathing caps and shipped on pallets. There are 6 jerry cans on each pallet. Each jerrican contains 30 kg propellant. (66.1 pounds)

The transport is performed according the procedures and extra precautions for hazardous materials.

Some examples of transport cost of 1 pallet, from Sweden to the customers final address, located in different areas:

England: € 380

Holland : € 140

Eastern USA: \$1,500

Western USA: \$1,700

These costs include all costs of transportation and hazardous material handling fees, but at export to US, there is also a customs clearance fee of \$95.

You can buy less than a full pallet, but the cost of transport and handling will be practically the same, making the transport cost per kg of propellant quite high.

In the same way, shipping of more than one pallet at the time, is costing just marginally more, making the transport cost per kg propellant lower.

HOW TO BUY PROPELLANT GRADE H₂O₂

For a detailed and binding quotation: Please fill in and send this online [order inquiry](#) to Peroxide Propulsion.



Truck loading of a pallet of HTP

SUPER HIGH CONCENTRATED AND HIGH PURITY H₂O₂, P98

We are able to produce and supply rocket grade hydrogen peroxide with concentration 98%, starting from September 2009.

Because of the production method, purity of P98 is even higher than our regular products,P80-P90.

This article was updated on September 28th, 2009