EVONIK INDUSTRIES

Cosmetic Formulations

Solutions for the cosmetic and personal care industry

Evonik. Power to create.

Content

Evonik is one of the world's largest producers of hydrogen peroxide. Our worldwide capacity (as of 2015) is more than 950 000 tonnes per year. We are the innovative leader in high quality products and services, offering more than a century of worldwide experience to serve the megatrends of the modern society and to deliver an exceptional value for our customers. To ensure optimal supply of hydrogen peroxide to the world market, we operate production facilities at thirteen locations around the world.

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Hydrogen peroxide is traditionally used in cosmetic and personal care products. It is often utilized as a bleaching agent in a wide variety of formulations for hair, skin, nail hardening and oral products.

High concentrated peracetic acid is used as an oxidant in chemical reactions, e.g. in the flavour and fragrances industry.

The cooperation between Brenntag and Evonik offers many benefits…

- High responsiveness
- Extensive market, product and industry know-how
- Products that meet an industry best
- Dedicated industry teams
- Health, safety and environmental requirements
- Operational and logistical solutions
- Tailor-made solutions
- High quality supply and sales team access
- Reduced supply chain costs
- Excellent technical support
- Applications laboratory for process simulations
- Specialists for on-site assistance
- Design and building of H_2O_2 storage and dosage units
- Optimization studies and services
- Inspections and safety training
- Regulatory support

A strong partnership will serve you better

Brenntag, the global market leader in chemical distribution, covers all major markets with its extensive product and service portfolio. It operates a global network with more than 490 locations in more than 72 countries. The support of their customers and suppliers with tailor-made distribution solutions for industrial and specialty chemicals combined with the long-standing experience and local excellence in the individual countries characterize the global market leader for chemical distribution.

The collaboration of Evonik and Brenntag in the industries pharma, medicine and cosmetics for certain countries of Europe combines the global presence, the global standardized supply chain quality and the reliability of two strong companies.

Evonik's global orientation as well as our highly developed supply chain guarantees reliable worldwide product availability. In combination with our reliability and the highest safety, health and quality values Evonik aims to protect people and the environment.

EVONIK INDUSTRIES

BRENNTAG

Regulatory excellence

Regulation (EC) No. 1223/2009 on cosmetic products obligates the personal care manufacturers to provide extensive product information files on their products. Therefore, a highly detailed characterization of each individual ingredient is mandatory. Evonik provides for all cosmetic grade hydrogen peroxide products:

- Impurity profile and composition
- Allergens and animal testing statement
- Documents on conformity with the provisions of the European Cosmetic Regulation
- Quality documents
- Nanomaterial and Phthalate (Annex II Cosmetic) statements
- Technical dossier of each cosmetic product

Furthermore, we are actively engaged in ongoing efforts to improve and adapt our product stewardship to the changing legislative environment as well as customer needs, to ensure PERSYNT® 350 B7, PERSYNT® 500 B7 and PERSYNT® 350 COS continue providing an exceptional value to our customers.

Grades

Offering the highest possible value for the cosmetic industry, Evonik supplies customized hydrogen peroxide products. The products PERSYNT® 350 B7, PERSYNT® 500 B7 and PERSYNT® 350 COS are specially designed for use as ingredients in various cosmetic formulations. PERSYNT® COS is equipped with a higher content of stabilizer package which makes it suitable for customers who prefer to make end formulations without the need to additionally stabilize the product. PERSYNT® B7 is the preferred choice for customers who intend to stabilize their end formulation themselves. PERACLEAN® is used as a highly selective, high-purity oxidant in the synthesis of fragrances.

Hydrogen peroxide grades

Cosmetic Grade	Specified hydrogen peroxide content, % (w/w)	Packaging
PERSYNT®350 B7	35.0 - 35.5	30 kg cans, 65 kg cans, 1100 kg IBC, bulk
PERSYNT®500 B7	49.5 - 49.9	30 kg cans, 65 kg cans, 1200 kg IBC, bulk
PERSYNT®350 COS	35.0 - 35.5	1100 kg IBC, bulk

Peracetic acid grades

	Specified PAA content, % (w/w)	Specified H_2O_2 content, % (w/w)	Packaging
PERACLEAN® 35	> =35.0	> =6.0	25 kg cans, 30 kg cans, 220 kg drums 1000 kg IBC incl. CDS
PERACLEAN® 40	> =38.5	> =4.0	25 kg cans, 30 kg cans

Important physico-chemical properties of aqueous solutions of hydrogen peroxide[1]

H_2O_2 concentration[2]	% (wt.)	0	30	35	50
	g (H_2O_2) / kg		300	350	500
	g (H_2O_2) / l		332	395	596
	mol / l		9.8	11.6	17.5
	mol %		18.5	22.2	34.6
Active oxygen content	% (wt.)	0	14.1	16.5	23.5
Molecular weight	g/mol	18.015			
Density at 20 °C	g/ml	0.998	1.111	1.131	1.195
Density at 30 °C	g/ml		1.105	1.124	1.187
Density at 40 °C	g/ml		1.098	1.118	1.179
Density at 50 °C	g/ml		1.091	1.110	1.171
Density at 60 °C	g/ml		1.084	1.103	1.163
Density at 70 °C	g/ml		1.077	1.095	1.154
Density at 80 °C	g/ml		1.069	1.087	1.145
Freezing point	°C	0	-26	-33	-52
Boiling point at 1013 mbar.	°C	100	106	108	114
Boiling point at 2026 mbar.	°C		132	135	145
Boiling point at 3039 mbar.	°C		147	150	161
Total vapor pressure (30 °C)	10^{-3}MPa		3.333	3.200	2.400
	mm. Hg.	31.6	25	24	18
H_2O_2 partial vapor	10^{-3}MPa		0.033	0.040	0.080
pressure at 30 °C	mm. Hg.		0.25	0.3	0.6
Specific heat at 25 °C	J*g/K	4.2	3.6	3.5	3.3
Refractive index, n25D at 25 °C		1.3325	1.3519	1.3554	1.3661
Viscosity at 20 °C	mPa*s	1.00	1.11	1.12	1.18
Surface tension at 20 °C	mN/m	72.8	74.2	74.5	75.7

[1]) The tabulated values, which are given above, describe physico-chemical properties of salt free pure aqueous solutions of hydrogen peroxide in water.
[2]) Hydrogen peroxide concentration can be expressed in weight percent, gram of 100%-age hydrogen peroxide in 1 kg solution, gram of 100%-age hydrogen peroxide in 1L solution and as molar concentration or molar fraction of hydrogen peroxide in solution. The tabulated values for g (H_2O_2)/l and mol/l are given for the temperature of 25 °C.

Packaging and storage

Common forms of packaging for PERSYNT®:

- Plastic canisters: 60 liters with content of 65 kg
- Plastic drums: 200 liters/220 kg
- IBC (Intermediate Bulk Container) 1000 - 1200 kg
- Road tanker, capacity about 25 tonnes
- Railroad car, capacity 28 - 68 tonnes
- Overseas ISO container, capacity 15 - 20 tonnes

Common forms of packaging for PERACLEAN®:

- Plastic containers: 30 liters with 25 kg or 30 kg
- Plastic drums: 200 liters/220 kg (only PERACLEAN® 35)
- IBC (Intermediate Bulk Container): 1000 kg (only PERACLEAN® 35)

Please check with your regional representative about the availability of desired grades and packaging systems.

Hydrogen peroxide containers should be stored in roofed, fireproof rooms where they can be kept cool and protected from sunlight. It is important that the hydrogen peroxide is protected against all types of contamination. Therefore, the containers should be stored unopened and in an upright position without blocking the breather vents. With proper storage in the original containers or in tank installations, the product can be stored safely for a long period of time without noticeable losses in concentration (typically less than 1% relative per year).

Through the use of a tank installation, efficient and economical storage together with an inplant supply to points of consumption is possible. For construction of storage tanks, pure aluminum and $AlMg_3$ can be used. Polyethylene (up to 60 % by weight H_2O_2) or stainless steel are preferred today owing to reduced corrosion problems.

Aluminum and stainless steel tanks can be installed horizontally or vertically, but for static reasons polyethylene containers must be installed only vertically.

For safety reasons, it is advisable to install larger storage containers in a dedicated area. Stainless steel has proven most effective for piping. Before initial filling, the storage tank and all parts in a hydrogen peroxide storage tank installation must be suitably cleaned and passivated. Storage tanks, intermediate containers, as well as dosing and reaction vessels must be fitted with venting equipment. In addition, hydrogen peroxide must not remain trapped in pipes between valves because decomposition at such points could lead to pressure build-up.

If ball valves are used, a vent hole must be drilled into the ball.

We at Evonik are happy to make available our extensive experience in the planning and construction of tank installations to our customers. Our Engineering Department carries out the planning, design, construction and initial filling, including prior cleaning. As the smallest unit 6 cubic meter tank installations are normally built which permit delivery of the product in 5 - tonne containers.

In general, such an installation is economically feasible for an annual requirement of at least 20 - 30 tonnes.

Labeling and transportation

Hydrogen peroxide solutions with concentration higher than 8% by weight as well as aqueous solutions of peracetic acid are dangerous substances, e.g. according to Global Harmonized System (GHS) and the European Regulation No. 1272/2008. They must be labeled and handled correspondingly. The exact classification of the particular product depends on the concentration of hydrogen peroxide and peracetic acid. The table below represents the classification of the products in the pharmaceutical and medical industry. Please refer to our Material Safety Data Sheet for details.

Regulations for Handling

Classification of aqueous hydrogen peroxide solutions and peracetic acid according to the European Regulation No. 1272/2008

PERSYNT® 350 B7		
Hazard statements	H302	Harmful if swallowed
	H315	Causes skin irritation
	H318	Causes serious eye damage
	H332	Harmful if inhaled
	H335	May cause respiratory irritation
Prevention statements	P261	Avoid breathing dust, fume, gas, mist, vapors, spray
	P280	Wear protective gloves, and clothing; eye and face protection
PERSYNT® 350 COS		
Hazard statements	H290	May be corrosive to metals
	H302	Harmful if swallowed
	H315	Causes skin irritation
	H318	Causes serious eye damage
	H332	Harmful if inhaled
	H335	May cause respiratory irritation
Prevention statements	P261	Avoid breathing dust, fume, gas, mist, vapors, spray
	P280	Wear protective gloves, and clothing; eye and face protection
PERSYNT® 500 B7		
Hazard statements	H302	Harmful if swallowed
	H315	Causes skin irritation
	H318	Causes serious eye damage
	H332	Harmful if inhaled
	H335	May cause respiratory irritation
Prevention statements	P261	Avoid breathing dust, fume, gas, mist, vapors, spray
	P280	Wear protective gloves, and clothing; eye and face protection
PERACLEAN® 35 / PERACLEAN® 40		
Hazard statements	H242	Heating may cause a fire
	H271	May cause fire or explosion, strong oxidizer
	H290	May be corrosive to metals
	H301	Toxic if swallowed
	H312	Harmful in contact with skin
	H314	Causes severe skin burns and eye damage
	H331	Toxic if inhaled
	H335	May cause respiratory irritation
	H410	Very toxic to aquatic life with long lasting effects
Prevention statements	P210	Keep away from heat/sparks/open flames/hot surfaces – no smoking
	P261	Avoid breathing dust/ fume/gas/mist/vapors/spray
	P264	Wash hands thoroughly with soap and water after handling
	P273	Avoid release to the environment
	P280	Wear protective gloves, and clothing; eye and face protection

Regulations for Transport

Hydrogen peroxide

Hydrogen peroxide up to a concentration of 8% by weight is not subject to any transport regulations. Concentrations between 20% and 60% by weight are classified as follows:

Transport classifications for PERSYNT® 350 B7, PERSYNT® 350 COS and PERSYNT® 500 B7	
UN-No.	2014
IMDG-Code, RID/ADR	5.1, 8, 2014; PG.II
Labels	

National regulations may differ from one country to another, and are being revised continuously. Customers who want to transport hydrogen peroxide within particular national boundaries should refer to the applicable national regulations.

Peracetic acid

Due to transport regulations and depending on composition of the specific grade, our products are classified either as oxidizers belonging to hazard class 5.1 (UN 3149) or as organic peroxides belonging to class 5.2 (UN 3109, UN 3105) and classified as corrosive, oxidizing and harmful to the environment.

Product	PERACLEAN® 35	PERACLEAN® 40
UN-No.	3109	3105
IMDG-Code, ARD/RID	3109, 5.2, 8	3105, 5.2, 8
Labels		

Handling

As a consequence of the properties of hydrogen peroxide and the safety aspects outlined in the previous chapters some basic rules for the handling of hydrogen peroxide are summarized as follow:

Rule	Comment
Everybody working with H_2O_2 should be trained to do so.	It is our policy to avoid safety risks and incidents wherever possible. Therefore, all personnel should be familiar with all necessary precautions and properties of this chemical.
Use dedicated equipment only.	It is the easiest way to avoid unintended contamination and compatibility problems.
Only carefully pre-cleaned drums, tubes, pumps and other equipment should be used.	Even with dedicated equipment it is essential to make sure, that all surfaces which come into contact with H_2O_2 are cleaned carefully.
Avoid any contamination!	Any contamination with impurities such as metal salts, dust, rust, wood, equipment or others is likely to accelerate the decomposition process.
Avoid higher pH-values!	Same as with contamination, a pH-value of 5 or above will increase the decomposition reaction. Any alkali products or caustic solutions have to be avoided.
Protect hydrogen peroxide from heat, direct sunlight and UV radiation.	Heat, light and radiation can also slightly increase the decomposition process.
Never return H_2O_2 to its original container.	H_2O_2 taken out of its original storage container or tank should never be returned. The risk of unintended contamination of the whole storage volume is just too high.
Make sure that Personal Protective Equipment (PPE) is used and emergency showers are available nearby!	Every person involved in handling of H_2O_2 has to wear its PPE (goggles, gloves etc). It is necessary to have immediate access to emergency showers and eye wash stations in case an incident occurs.
Have water hoses available in case of an emergency.	Besides water for personal safety it is always the method of choice to have plenty of water available for dilution or cooling in case of an emergency.
Never confine hydrogen peroxide in drums, tanks, tubes etc.!	H_2O_2 always tends to develop overpressure. Therefore, it is mandatory to have pressure relief equipment installed in every part of your system.
Keep storage temperature under surveillance.	Increasing temperature is an excellent indicator for problems in a tank.
Make sure that only compatible working materials are used.	The most common compatible materials are glassware, polyethylene, polyvinylchloride, Teflon, stainless steel, pure aluminum.
Avoid any contact with inflammable material and organic substances.	H_2O_2 is a reactive agent and a strong oxidizer. It is very likely that it reacts with combustible, inflammable or oxidizable materials, possibly resulting in a violent reaction.

In case of any doubt or question feel free to contact your Evonik representative for further help.

Safety aspects

Safety has always been one of Evonik's main concerns. As we have clearly committed ourselves to the Responsible Care Program of the chemical industry, we strive for the highest possible level of safety within our own plants and laboratories as well as those of our customers. In this chapter we have summarized the safety risks related to hydrogen peroxide, its handling and storage. Today, many risks are rather unlikely because a globally accepted technical standard exists. However, everybody should be aware of the risks and understand the necessity of certain precautions while working with hydrogen peroxide.

Hydrogen peroxide is a clear colorless liquid, which resembles water. Therefore, spilled product or hydrogen peroxide in unlabeled containers could erroneously be regarded as water.

Hydrogen peroxide is corrosive to the skin and eyes as well as to metal surfaces. It is a strong oxidizing chemical and, therefore, tends to react rapidly, sometimes even violently with various substances.

Hydrogen peroxide solutions themselves are not flammable. Highly concentrated hydrogen peroxide, however, can ignite inflammable materials, and the oxygen released by decomposition additionally promotes the combustion. Even at low concentrations, ignition can occur under unfavorable conditions after a gradual concentration of the hydrogen peroxide due to evaporation of water.

Vapors can explode if the hydrogen peroxide concentration in the vapor phase is higher than 26 mol% (40 % w/w). Explosions are ignited by sparks, contact with a catalytically active material, or – at temperatures above 150 °C – even by catalytically non-active materials.

At normal pressure, such vapour compositions can only occur if the hydrogen peroxide concentration of the liquid is 74 wt % w/w or higher and the temperature of the liquid is higher than 100 °C.

Explosive and shock-sensitive mixtures can be formed if concentrated hydrogen peroxide comes into contact with organic compounds. According to data in the literature, there is a general risk of detonations if the content of hydrogen peroxide in the resulting mixture is 25 % by weight or above. In any case, appropriate safety precautions must be taken to avoid critical conditions.

First aid

Instructions

Contact with skin	Wash affected skin with plenty of water. Remove all contaminated clothing immediately. In case of burns or shock, seek medical attention.
Contact with eyes	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Ingestion	Drink plenty of water. Seek medical attention.
Inhalation	Move the victim out into the fresh air – wear a respirator. In case of suffocation, seek medical attention.
Leak or spill	Drench with water. Wash the liquid off all contaminated surfaces with plenty of water. Do not absorb in sawdust or other combustible materials. Do not attempt to recover spilled liquid. Drench with water only.
Fire	Cool the tank from outside with water to avoid higher temperatures for the stored material. Fires where hydrogen peroxide is involved directly or indirectly should be extinguished with water.

Response statements according to European Regulation No. 1272/2008

$35\% \leq H_2O_2 < 50\%$	
P301+P312	IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P303+P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

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Disclaimer

This information and all further technical advice are based on our present knowledge and experience. However, it implies no liability or other legal responsibility on our part, including with regard to existing third party intellectual property rights, especially patent rights. In particular, no warranty, whether express or implied, or guarantee of product properties in the legal sense is intended or implied.
We reserve the right to make any changes according to technological progress or further developments. The customer is not released from the obligation to conduct careful inspection and testing of incoming goods. Performance of the product described herein should be verified by testing, which should be carried out only by qualified experts in the sole responsibility of a customer. Reference to trade names used by other companies is neither a recommendation, nor does it imply that similar products could not be used.

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