Food Processing with Hydrogen Peroxide

Solvay Interox

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Chances are, some of the foods and beverages you had today were treated with hydrogen peroxide (H_2O_2). If you had margarine, cheese, instant tea, wine or aseptically packaged milk or juice, odds are that hydrogen peroxide improved the product.

Hydrogen peroxide makes foods better in several ways

- **Hydrogen peroxide bleaches and cleans foods to improve color.**
- **Hydrogen peroxide sterilizes aseptic packaging containers to prolong the shelf life of products.**
- **Hydrogen peroxide removes unwanted substances, such as sulfur dioxide or residual chlorine.**
- **Hydrogen peroxide purifies food products.**

Why Food Grade hydrogen peroxide?

Solvay Interox Food Grade hydrogen peroxide is a clear, colorless, slightly viscous liquid, lightly stabilized and formulated to meet U.S. Food Chemicals Codex specifications.

In July of 1986, the U.S. Food and Drug Administration affirmed the GRAS (Generally Recognized as Safe) status of hydrogen peroxide as a direct component of food. This affirmation covers specific applications as listed in the Federal Register.

All hydrogen peroxide used in food processing must meet the specifications of the Food Chemicals Codex (21 CFR 178.1005(c) and 21 CFR 184.1366(b)). The Food Chemicals Codex specification for hydrogen peroxide is shown in Table One. Specific approved uses for hydrogen peroxide are listed in Table Two.

Table One: Hydrogen Peroxide Specification Food Chemicals Codex

H_2O_2 concentration w/w	**35% or 50%**
Acidity (as H_2SO_4), ppm, max	300
Arsenic (As), ppm, max	3
Heavy Metals (as Pb), ppm, max	10
Iron (Fe), ppm, max	0.5
Phosphate (PO_4), ppm, max	50
Dry Residue, ppm, max	60
Tin (Sn), ppm, max	10

Table Two:
Uses of H_2O_2 in Food Processing

Functional Use	Food	Maximum Treatment Level	Authorization
Sterilization	Aseptic packaging	<0.5 ppm H_2O_2 in distilled water packaged under production conditions	21 CFR 178.1005
Antimicrobial agent	Milk for cheesemaking	0.05%	21 CFR 184.1366(c) 21 CFR 133.113(a)(3) 21 CFR 133.113(a)(3)(v) 21 CFR 133.136(a)(3) 21 CFR 133.136(b)(3)(v) 21 CFR 133.144(a)(3) 21 CFR 133.144(b)(3)(v) 21 CFR 133.195(a)(3) 21 CFR 133.195(b)(3)(vi) 21 CFR 133.118(c)(3)
	Whey	0.04%	21 CFR 184.1366(c)
	Starch	0.15%	21 CFR 184.1366(c) 21 CFR 184.892(g)
Oxidizing/reducing agent	Dried eggs, dried egg whites and dried egg yolks	Amount sufficient for the purpose	21 CFR 184.1366(c) 21 CFR 160.105(b)(1) 21 CFR 160.145(b)(1) 21 CFR 160.185(b)(1)
	Wine	Amount sufficient for the purpose	21 CFR 184.1366(c)
	Corn syrup (to remove SO_2 in finished product)	0.15%	21 CFR 184.1366(c)
	Starch (to remove excess SO_2)	0.15%	21 CFR 184.1366(c) 21 CFR 172.892(g)
Antimicrobial agent	Wine vinegar (remove SO_2 from wine prior to fermentation to produce vinegar)	Amount sufficient for the purpose	21 CFR 184.1366(c)
Bleaching agent	Tripe	Amount sufficient for the purpose	21 CFR 184.1366(c)
	Emulsifiers containing fatty acid esters (hydroxylated lecithin)	1.25%	21 CFR 184.1366(c) 21 CFR 172.814(a)(1) 21 CFR 172.814(a)(2)
	Beef feet	Amount sufficient for the purpose	21 CFR 184.1366(c)
	Herring	Amount sufficient for the purpose	21 CFR 184.1366(c)
	Instant tea	Amount sufficient for the purpose	21 CFR 184.1366(c)
	Colored (annatto) cheese whey	0.05%	21 CFR 184.1366(c)
	Starch	0.95%	21 CFR 172.892(b)
	Lecithin	Amount sufficient for the purpose	21 CFR 172.814(a)(1)

Information accurate as of March 31, 2000.

Hydrogen peroxide advantages

- ***No toxic residue***. When hydrogen peroxide is used in food applications, dosing is controlled to minimize the amount of residual H_2O_2. This excess normally decomposes into oxygen and water in subsequent processing stages, such as drying. Testing for residual H_2O_2, where required, is easily accomplished using standard analytical techniques or test strips.

- ***Ease of handling***. Hydrogen peroxide is infinitely soluble in water, so aqueous solutions of the proper strength to meet food processing needs are easily prepared. As a water-based solution, the product is compatible with most common processing techniques, such as spraying, dipping or batch mixing. Properly handled, hydrogen peroxide is a safe and easy-to-use chemical.

- ***Effectiveness***. When activated, hydrogen peroxide brings the power of the hydroxyl radical (OH+) and perhydroxyl ion (OOH-) to bleaching and sanitizing of food products. Very powerful oxidizers, the OH+ radical and OOH- ion perform better than most alternative products with the added benefit that H_2O_2 is an environmentally compatible chemical.

Which type of Solvay Interox Food Grade?

Solvay Interox offers two types of Food Grade hydrogen peroxide tailored to specific end-use needs of aseptic packaging and food processing. Approved uses of Food Grade hydrogen peroxide include its use as a bleaching agent, as an antimicrobial agent, and as an oxidizing/ reducing agent.

Food Grade hydrogen peroxide is a high purity, low residue, lightly stabilized peroxide formulation developed for spray-type and mist-type aseptic packaging equipment. The high purity of the product minimizes residue build-up on spray and mist nozzles. Food Grade hydrogen peroxide may also be used for traditional food processing applications such as bleaching, microbial control, sulfite reduction and product purification whenever a low residue peroxide formulation is desirable.

PFP™ hydrogen peroxide is specially formulated with Food Grade stabilizers to stand up to high temperature applications like immersion-type aseptic packaging. Added resistance to decomposition helps mitigate the effects of contact with stainless steel equipment and contaminants. For traditional food processing applications at high temperatures, PFP is the hydrogen peroxide formulation of choice.

Hydrogen peroxide in food applications

Frequently asked questions

When I bleach or purify with hydrogen peroxide, will there be a residue?
Hydrogen peroxide dosing is typically controlled to ensure that only a minimal amount of hydrogen peroxide remains in the process. This residual will decompose in most common subsequent processing steps, such as drying. Hydrogen peroxide decomposes to form water and oxygen, and the only other residual chemicals are extremely small levels of stabilizers, which are approved as stated in the Food Chemicals Codex.

Alternatively, some processors add small amounts of catalase enzyme to destroy any remaining H_2O_2.

How does Food Grade hydrogen peroxide differ from other grades of H_2O_2, and how is it used?
Food Grade hydrogen peroxide is lightly stabilized and exceeds the purity requirements in the Food Chemicals Codex. By contrast, most technical grades of hydrogen peroxide are more heavily stabilized to work in a wide variety of industrial applications.

How easy is it to apply hydrogen peroxide as a bleaching agent or for microbial control?
Very simple. Hydrogen peroxide can be easily dosed into any process with a metering pump or by gravity feed. Equipment and piping should be constructed from hydrogen peroxide-compatible materials such as high purity aluminum, 304L or 316L stainless steel, or polyethylene. Since hydrogen peroxide is 100% miscible in water in all proportions, application techniques at any desired concentration are attainable.

Is Food Grade hydrogen peroxide approved for human consumption?
No. The Food and Drug Administration (FDA) has not approved hydrogen peroxide for human consumption; therefore, the sale of hydrogen peroxide for this purpose is illegal. Solvay Interox endorses the position of the FDA and will not supply hydrogen peroxide to anyone who condones the sale of hydrogen peroxide for consumption or who knowingly sells our product to those who do.

For further information, please refer to our technical data sheet "*Human Consumption of Hydrogen Peroxide.*"

Solvay Interox is dedicated to customer satisfaction

We strive to make your experience with Solvay Interox peroxygens safe, efficient, and hassle-free. Most of the important product and contact information is readily available at www.solvayinterox.com. You may also contact us by calling 1-800-INTEROX (1-800-468-3769), or writing to Solvay Interox, Inc. at 3333 Richmond Avenue, Houston, Texas 77098.

Solvay Interox Quality Policy

"Total Customer Satisfaction through Operational Excellence"
This policy means that we pursue the highest standards of excellence in every facet of our business. We dedicate ourselves to this effort because we know that our success depends on satisfying you.

Our Quality Management System demonstrates this commitment by meeting the requirements of the ISO 9002:1994 International Quality Standard. The manufacture and distribution of hydrogen peroxide at our plants in Deer Park, Texas, and Longview, Washington, as well as the support activities at our Houston headquarters, are registered to the ISO 9002:1994 Standard.

Safety

Like all other powerful chemicals, hydrogen peroxide must be treated with respect and handled appropriately. For a full discussion of safe handling of this product, please see our publication "Hydrogen Peroxide Safety and Handling," available upon request, or as a download from our website at www.solvayinterox.com.

Delivery

In North America, Solvay Interox ships product from two plant sites and a number of strategically located distribution terminals. We operate a fleet of high-purity aluminum and stainless steel tank trucks and railcars dedicated to hydrogen peroxide service.

We also can provide stainless steel IM101 ISO containers to deliver, store, and dose liquid hydrogen peroxide. These isotainers are ideally suited to seasonal or short-term needs. In emergency situations, our Quick Response program will get isotainers of hydrogen peroxide to your site right away. For information on our excellent delivery capability, call 1-800-INTEROX, or see our brochure "Isotainers for Quick Response", which is available on our website at www.solvayinterox.com.

Responsible Care®

Recognizing the importance of preserving the environment of the planet we share, and the health and safety of the employees who produce our products, Solvay Interox actively supports the Responsible Care® program of the American Chemistry Council.

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