



## **Product Stewardship Summary**

### **Potassium Hydroxide**

#### **Summary**

Potassium hydroxide (caustic potash) serves a wide range of end use markets. The largest users of potassium hydroxide are the soap and detergent, fertilizer, and chemical industries. Minor uses include the production of molten salts, dyes, pharmaceuticals, and photographic chemicals.

OxyChem markets potassium hydroxide in both liquid and dry form. The solutions are available in 45% and 50% concentration. The dry form is marketed in flake and crystal form. The chemical formula of potassium hydroxide is KOH. Potassium hydroxide is corrosive, and it must be stored and handled with this hazard in mind.

#### **1. Chemical Identity**

Name: Potassium hydroxide

Synonyms: Caustic potash

Chemical Abstracts Service (CAS) number: 1310-58-3

Chemical Formula: KOH

Molecular Weight: 56.11

#### **2. Production**

OxyChem manufactures potassium hydroxide by the electrolysis of potassium chloride brine in a membrane electrolytic cell. The co-products are chlorine gas and hydrogen gas. The reaction is:



In the membrane process, a solution of approximately 30% in strength is formed. The solution is then sent to evaporators, which concentrate it to a strength of 45% or 50% by removing the appropriate amount of water. The resulting caustic potash solution is stored in tanks prior to shipment.

OxyChem has played a leading role in providing caustic potash to meet the increasing demands of industry. OxyChem plants are strategically located to conveniently and economically serve industry. Warehouse stocks of our potassium hydroxide and other products are maintained in many principal cities. Distributor stocks are also available in these and many other cities and form a network of supply for the end user's convenience.

### 3. Uses

Caustic potash is one of the few chemicals finding almost universal application. Some of the principal products or processes in which caustic potash is used are:

- A dehydrating agent for drying gases
- A lubricant in the extrusion pressing of high melting alloys
- A scavenger in a gasoline treating process (dual layer) for removing mercaptans
- A methylating agent
- An alkaline builder in detergent formulations
- In refining petroleum fractions
- In electrolytic stripping baths
- In chemical compounding
- In a molten bath for removing polyesters and polyurethanes from steel objects
- In an absorption cartridge for scavenging carbon dioxide
- As a chemical desiccant
- As a cleaner for eliminating scale from the surface of titanium alloy intermediates
- As an agent for lowering the sulfur content of coal
- In alkaline batteries
- In removing insulating coatings from wire
- In purifying olefin feedstock containing hydrocarbons prior to polymerization
- In stabilizing synthetic lubricants
- In removing naphthenic acids from gas oils
- In fertilizers
- In descaling ferrous metals
- In sweetening sour petroleum fractions
- In a fused alkaline salt mixture used for metal cleaning
- In lye peeling

### 4. Physical and Chemical Properties

#### Corrosivity

Potassium hydroxide in both liquid and dry form has a markedly corrosive action on all body tissue. Even dilute solutions may have a destructive effect on tissue after prolonged contact. Inhalation of concentrated mists can cause damage to the upper respiratory tract. Ingestion of liquid potassium hydroxide can cause severe damage to the mucous membranes or other tissues where contact is made.

#### Reactivity

Potassium hydroxide is a corrosive chemical that is normally handled in either steel, nickel, nickel alloys or certain types of plastic equipment. The most common construction materials for handling and storing potassium hydroxide solutions are black iron and mild steel. However, liquid potassium hydroxide will attack these metals at elevated temperatures. Aluminum, copper, zinc, lead, tin and their alloys (e.g., brass and bronze) are NOT suitable. Potassium hydroxide readily attacks these materials.

In addition, considerable heat is generated when liquid or dry potassium hydroxide is mixed with water, which can result in boiling or splattering and may cause a violent eruption. When diluting, always add potassium hydroxide to water. Never add water to potassium hydroxide.

### 5. Health Effects

Potassium hydroxide solutions are alkaline solutions, meaning they have high pH. The pH can be greater than 12. This property means potassium hydroxide is a severe eye, skin, and respiratory tract irritant, and it can burn any tissue with which it comes in contact.

- Eye splashes are especially serious hazards. Contact with the eyes can cause severe irritation, pain, and corneal burns possibly leading to blindness.
- Direct contact with the skin may cause severe burns if the material is not quickly rinsed away with large amounts of water.
- Inhaling mists of potassium hydroxide may result in irritation of the nose and throat with symptoms such as burning, coughing, choking and pain. Inhaling concentrated mist may result in pulmonary edema and shock.
- Ingesting potassium hydroxide may cause pain and burns of the esophagus and gastrointestinal tract. Ingestion can lead to corrosion of the mucous membranes of the upper part of the digestive tract. Death may result from shock, perforation of the esophagus, aspiration from the esophagus into the trachea (asphyxia), or infection from the corroded tissues.

Potassium hydroxide is not classified as a carcinogen by the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or the Occupational Safety and Health Administration (OSHA).

## **6. Environmental Effects**

Potassium hydroxide is moderately toxic to aquatic organisms. It dissociates in water and can elevate the pH of systems that are not well buffered. Since it contains no degradable functional groups, it exerts no biological oxygen demand.

## **7. Exposure**

Potassium hydroxide is corrosive to the skin and eyes. The most likely ways exposures could occur are:

- Worker exposure – Exposure could occur in the manufacturing facility or in industrial facilities that use potassium hydroxide. When exposures occur, they are typically skin or eye exposures. Good industrial hygiene practices and personal protective equipment minimize the risk of exposure.
- Consumer exposure – OxyChem does not sell potassium hydroxide in retail stores, although it may be an ingredient in some consumer products.
- Releases – If a spill occurs, emergency personnel should wear protective equipment to minimize the risk of exposures.

## **8. Recommended Risk Management Measures**

Potassium hydroxide is non-flammable, non-explosive, and non-toxic. It is, however, an alkaline material and poses hazards to the skin and eyes. Potassium hydroxide can react with certain materials of construction. Prior to using potassium hydroxide, carefully read and comprehend the Material Safety Data Sheet. The following are some risk management measures that are effective against these hazards:

- Provide eyewash fountains and safety showers in areas where potassium hydroxide is used or handled. Any potassium hydroxide burn may be serious. Flush areas that have come in contact with potassium hydroxide with large amounts of water, and then seek medical attention. DO NOT use any kind of neutralizing solution, particularly in the eyes, without direction by a physician.

- To prevent eye contact, protective eye wear (such as splash goggles, a full face shield, or safety glasses with side shields) must be worn.
- Work areas where potassium hydroxide is used should be well ventilated. If exposures exceed accepted limits or if respiratory discomfort is experienced, use a NIOSH approved air purifying respirator with high efficiency dust and mist filters
- Wear chemical resistant clothing to prevent contact with the body. Suitable materials include butyl rubber, natural rubber, nitrile, PVC, and Tychem.
- Wear rubber gloves to protect the hands while handling potassium hydroxide. Gloves should be long enough to come well above the wrist, and sleeves should be securely positioned over the glove wrists.
- Potassium hydroxide causes leather to disintegrate rapidly. For this reason, wear rubber boots. Wear the bottoms of trouser legs outside the boots. DO NOT tuck in.
- Residues that dry on equipment can cause irritation. Keep equipment clean by promptly washing off any accumulation.
- Proper labeling, handling and storage of potassium hydroxide will reduce the likelihood of accidental ingestion.
- Equipment used for potassium hydroxide storage or processing should be constructed of the proper materials. For example, bulk storage containers should be constructed of mild, carbon, or stainless steel. Do not use aluminum as a material of construction. For more detailed information regarding materials of construction, refer to the OxyChem Handbook.
- The packing glands of pumps used in potassium hydroxide service should be shielded to prevent spraying in the event of a leak.
- A safety shield of wrap-around polypropylene is recommended for all flanged joints. This will protect personnel against spraying in case a gasket leaks.
- When making solutions, always add the potassium hydroxide slowly to the surface of the water with constant agitation. Never add the water to the potassium hydroxide. Always start with lukewarm water (80 -100°F). Never start with hot or cold water. Dangerous boiling or splattering can occur if potassium hydroxide is added too rapidly, allowed to concentrate in one area or added to hot or cold liquids. Care must be taken to avoid these situations.
- Personnel involved with potassium hydroxide handling operations should be properly trained. For detailed recommendations regarding personnel involved in unloading potassium hydroxide, refer to the OxyChem Handbook.

## **9. Product Stewardship Programs**

An OxyChem product handbook is available for potassium hydroxide. The handbook includes extensive physical property and technical data regarding the product as well as more detailed information about the manufacturing process and product uses. In addition, specific information for storing, unloading, preparing and using potassium hydroxide safely is provided, including data on materials of construction and equipment recommendations.

## **10. Regulatory Compliance Information**

The following is a summary of regulations and guidelines that may pertain to potassium hydroxide (additional regulations and guidelines may apply):

- Potassium hydroxide is designated as a hazardous substance under Section 311(b) (2) of the Clean Water Act. See 40 CFR 116.4.
- A release of potassium hydroxide in an amount greater than the Reportable Quantity (RQ) is subject to reporting under Comprehensive Environmental Response, Compensation and Liability Act, Section 103. The federal RQ for potassium hydroxide is 1000 pounds. See 40 CFR 302.4.
- Possible Resource Conservation and Recovery Act (hazardous waste) Codes: D002
- Potassium hydroxide has Generally Recognized as Safe (GRAS) status as a direct and indirect human food ingredient under specific Food and Drug Administration (FDA) regulations.
- Potassium hydroxide, liquid, is regulated by the U.S. Department of Transportation (DOT) and is classified as a corrosive material. The DOT identification number is UN 1814 (solution) and UN1813 (solid).
- The American Conference of Governmental Industrial Hygienists has established a Threshold Limit Value for potassium hydroxide. The guideline is 2 mg/m<sup>3</sup> as a ceiling limit.

## 11. Sources for Additional Information

American Conference of Governmental Industrial Hygienists (ACGIH), Documentation of the Threshold Limit Values and Biological Exposure Indices, 6th ed., 1 (1991), Potassium hydroxide and corresponding entry in "Pocket Guide" 1992.

New Jersey Department of Health and Senior Services, Hazardous Substance Fact Sheet, Potassium Hydroxide, Rev. May 2001.

Hazardous Substances Data Bank (HSDB), HSDB Number 1234, Last revision date: June 24, 2005.

OxyChem Product Handbook web site:

<http://www.oxy.com/OurBusinesses/Chemicals/Products/Documents/CausticPotash/kohhandb.pdf>

OxyChem Material Safety Data Sheet web site: <http://msds.oxy.com/>

Registry of Toxic Effects of Chemical Substances (RTECS), RTECS Number TT2100000, Review Date: May 2008.

**12. Contact Information:** For additional information, call 1-800-752-5151 or 1-972-404-3700.

**13. Preparation Date:** 12/12/2008 **Revised:** 02/13/2013

This Product Stewardship Summary is intended to give general information about the product discussed above. It is not intended to provide an in-depth discussion of all health and safety information about the product or to replace any required regulatory communications.

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