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Sodium Hypochlorite to Hydrogen Peroxide a Comparison

Introduction

This is a paper created to compare and contrast the composition, use, safety and cost of sodium hypochlorite (bleach) and hydrogen peroxide as cleaning and sanitizing agents. Both are formidable in their own right but should be treated very differently.

Composition

Sodium Hypochlorite (SH) is a yellow liquid commonly called bleach, pool shock and liquid chlorine. It in fact is not liquid chlorine and this is the most common misnomer in consumer circles today. Sodium hypochlorite is not chlorine at all. Chlorine is a gas. It is always a gas. There are three stages of matter, solid, liquid and gas. Chlorine cannot be cooled enough in Earth's atmosphere to become a liquid. Therefore, liquid chlorine does not exist. What we all know as liquid chlorine is common household bleach. SH is an oxidizer. This means that when SH comes in contact with organic material it has a chemical reaction, breaking the organic molecule and consuming oxygen gas. The bi-product or waste product of the chemical reaction is chlorine gas. As the chlorine gas escapes and the available oxygen is consumed a bleaching reaction happens. This is why SH is commonly called bleach.

Hydrogen Peroxide is a clear fluid and is odorless. It's chemical compound is H₂ O₂ which is only one oxygen molecule different from water which is H₂ O. It has many common household uses as a disinfectant and laundry booster (sodium percarbonate as a dry powder) Hydrogen Peroxide is highly reactive and like sodium hypochlorite it is an oxidizer. Hydrogen peroxide does have some bleaching capabilities but is not as capable of removing color (bleaching) as sodium hypochlorite. Like sodium hypochlorite, hydrogen peroxide reacts with organic material breaking the organic molecule and consumes oxygen gas. Unlike sodium hypochlorite, hydrogen peroxide does not release chlorine gas.

Typical Uses

Sodium hypochlorite is commonly used for water sanitation, paper whitening, food preservation, medical procedures and janitorial cleaning and sanitation to name a very few. This is the predominant product used in the soft wash cleaning industry as well as down streamed by power washing professionals.

Hydrogen peroxide is commonly used similarly in water sanitation and medical procedures for the disinfecting value. In the food industries it is used for surface cleaning and preparation. In the janitorial cleaning and sanitation industry hydrogen peroxide is used as a surface sanitizer.

Safety & Transportation

Both sodium hypochlorite and hydrogen peroxide are on the USDOT lists for Hazardous materials as well as for Hazardous Substances. There are many regulations you will have to observe for both, but we have boiled the most important ones that apply to both chemicals. You cannot transport either by air. You must follow packaging group 8 instructions for acceptable containers offered up for transport. Sodium Hypochlorite is a Class II Corrosive and hypochlorite solutions in their entirety are regulated for transport by the USDOT regardless of percent of available SH. Hydrogen peroxide is a Class V oxidizer and is regulated for transport by the USDOT in solutions greater than 8%. Either of these chemicals packaged in containers of 119 gallons (single or aggregate) or more will require the driver

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to have a Commercial Driver's License, Hazardous Materials Endorsement, Medical Card, display placards and have the appropriate DOT required equipment onboard their truck. Our recommendation is to limit sales to non-qualified transporters to tow (2) 55-gallon drums to avoid DOT issues.

Surface & Substrate Awareness

Using any kind of cleaning or sanitizing solution on a surface requires a careful look at surface compatibility. Even the gentlest of simple chemical compounds can have adverse effects from hard durable surfaces to and including less robust fabrics and fairer materials. Many cleaning and sanitizing solutions have strong swings towards either side of the PH scale acid or alkaline. These products should be tested for compatibility before any surface undergoes a thorough cleaning and / or sanitation treatment. Sodium hypochlorite is safe in weak solutions below 1% available SH for surfaces but still may bleach color from porous surfaces like fabrics and wood. Hydrogen Peroxide though not as aggressive in the bleaching aspect can dry some porous surfaces and etch into many paints and plastics.

It is important to remember which product is best used outside and which is best used inside. Both in weak solutions are easy on surfaces especially if you are rinsing the cleaned and sanitized surface afterwards. However, as a leave behind Sodium Hypochlorite is best used outdoors on robust, durable surfaces. If you need to venture indoors for sanitation Hydrogen Peroxide may be best for spraying or fogging spaces that have carpet, wood or store paper documents that may come in contact with the HP.

It is a best practice to hand clean any surface before treatment and then do a small test patch to ensure that either the sodium hypochlorite or hydrogen peroxide doesn't mar or stain the surface treated. Especially if you plan on using it as a leave-behind treatment.

Possible Reactions and Following Labeled Instructions

Sodium hypochlorite and Hydrogen Peroxide are oxidizers and will react violently when mixed with other chemicals. Ammonia, vinegar and other household cleaners will produce a toxic / noxious gas when combined with SH or HP. It is important to carefully read label instructions for any products you may be using for cleaning or sanitation. Do not mix incompatible chemicals.

Breakdown and Degradation

Sodium hypochlorite and Hydrogen Peroxide can be broken down by several sources. UV light, organic material, ferrous metals and aeration / agitation to name a few. Keep your unused products in a well-sealed container, in a cool dark place, stored separately from other products or chemicals that may react adversely with SH or HP.

Cost & Feasibility

Sodium hypochlorite is widely available being sold in grocers, convenience stores, home improvement stores, pool supplies stores and industrial supplies. Hydrogen peroxide is not as widely available but can be found in small amounts quart size and smaller in drug stores, grocers and larger containers at industrial supplies. By far sodium hypochlorite is easier to find and in much larger volumes.

Cost is also something to be considered. Sodium hypochlorite (bleach) can be as inexpensive as .99 / gallon and as expensive as \$5 / gallon. It comes in generally two labeled strengths for general consumers, 5% and 10% available sodium hypochlorite. Industrial sodium hypochlorite which is generally used in pool water sanitation comes in a 12.5% labeled strength. The stronger the available sodium hypochlorite the more cost, however buying in bulk can reduce 12.5% HP costs down to .90 / gallon.

Hydrogen peroxide can be very expensive. .99 / 32 ounces for household strength and as expensive as \$35 / gallon for industrial disinfectant strength. It comes in generally two labeled strengths, for general consumers 35% and industrial at 70% available hydrogen peroxide. The stronger the available hydrogen peroxide the more cost, however buying in bulk can reduce 70% HP costs down to \$10 / gallon.

Conclusion

Both products are equal in uses and strengths whereas sanitation and disinfecting are needed. That only withholding is sodium hypochlorite has a much stronger bleaching and cleaning effect. Hydrogen peroxide will remove color in most organics but not as well in man-made fabrics etc. Hydrogen peroxide will yellow a color and not whiten as well. Both products will absolutely clean, sanitize, disinfect and sterilize when used at proper concentrations. Hydrogen peroxide because of its safety around fabrics and documents makes an excellent interior sanitizer / disinfectant as well as has no odor or color. Sodium hypochlorite must only be used in well ventilated areas on durable colorfast surfaces. Indoor occasionally but certainly outdoors is its strength. Where you need an instant, robust clean with a string sanitizing effect, especially where cost is concerned move forward with sodium hypochlorite (bleach). However if cost is not an issue and you are working indoors on delicate surfaces we do recommend hydrogen peroxide.