

# TerranearPMC Safety Share

## Week of January 8, 2018 – Chemical Incompatibilities

Chemicals are part of our daily life. We use them in industry, office environments, and scientific research as well as in our homes. And while we typically think of dangerous or hazardous chemicals as items used for industrial purposes, some of the most potent chemicals are used in our own residents. Nowadays, unclogging a sink, or cleaning toilets and floor tiles; even cleaning our driveways; involve the use of strong acids or alkalis (i.e. bases). We also use many different types of organic solvents such as turpentine, gasoline, nail polish (acetone), and lacquer thinner around the house. Just think of it: imagine accidentally mixing some lawn fertilizer - which contains ammonium nitrate - with any one of the cleaning solvents we keep around the house. That's ammonia nitrate and an organic mixture. So unexpectedly, we could create a highly reactive mixture that has the potential to unleash such a tremendous force, destroying property as well as severely injuring (or worse) persons.

Data collected by the Hazardous Substances Emergency Events Surveillance (HSEES) System, set up by Agency for Toxic Substances and Disease Registry (ATSDR) to track incidents involving chemical spills, indicates the unintentional release and misuse of common household products in the home has become a real problem. During 1996-2001, the HSEES recorded 659 events that resulted in 352 injuries and nine deaths in 17 states.

While chemistry is, indeed, a central science which everyone should have some knowledge, it is NOT a discipline to learn through curiosity by randomly mixing together chemicals to see what will happen. The point to be made is that household chemicals really aren't any safer than lab chemicals. In particular, you should use care when dealing with cleaners and disinfectants, since these are common products that react with each other to yield nasty results. Also, it's a good rule of thumb to avoid mixing bleach or peroxide with any other chemical, unless you're following a documented procedure, while wearing protective gear, and are working under a fume hood or outdoors.

Many chemical mixtures produce toxic or flammable gases. While fire extinguishers are mandatory in the workplace, it's a good idea to have one in the home as well. And they should be properly charged and located in an accessible location. Of course, the fire extinguisher should be the right classification, which is typically an ABC, which means it is designed to extinguish fires involving combustibles, flammables as well as electrical appliances. Unless used under carefully controlled conditions, chemicals should not be stored and used near an open flame or heat source. This includes pilot lights for ovens, fireplaces, and water heaters.

While it's common to label chemicals and store them separately in a lab, it's also good practice to do this in a home. For example, don't store muriatic acid (hydrochloric acid) with peroxide. Avoid storing household bleach together with peroxide and acetone.

Of course some chemicals shouldn't be mixed together. In fact, chemicals like acids and peroxides shouldn't even be stored near each other on the chance that an accident could occur and the chemicals could react. Be sure to keep incompatibilities in mind when reusing containers to store other chemicals. Here are some examples of mixtures to avoid:



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- Acids with cyanide salts or cyanide solution. Generates highly toxic hydrogen cyanide gas.
- Acids with sulfide salts or sulfide solutions. Generates highly toxic hydrogen sulfide gas.
- Acids with bleach. Generates highly toxic chlorine gas. An example of this would be mixing bleach and vinegar.
- Ammonia with bleach. Releases toxic chloramine vapors.
- Oxidizing acids (e.g., nitric acid, perchloric acid) with combustible materials (e.g., paper, alcohols, and common solvents). May result in fire.
- Solid oxidizers (e.g., permanganates, iodates, nitrates) with combustible materials (e.g., paper, alcohols, other common solvents). May result in fire.
- Hydrides (e.g., sodium hydride) with water. May form flammable hydrogen gas.
- Phosphides (e.g., sodium phosphide) with water. May form highly toxic phosphine gas.
- Silver salts with ammonia in the presence of a strong base. May generate an explosively unstable solid.
- Alkali metals (e.g., sodium, potassium) with water. May form flammable hydrogen gas.
- Oxidizing agents (e.g., nitric acid) with reducing agents (e.g., hydrazine). May cause fires or explosions.
- Unsaturated compounds (e.g., substances containing carbonyls or double bonds) in the presence of acids or bases. May polymerize violently.
- Hydrogen peroxide/acetone mixtures when heated in the presence of an acid. May cause explosions.
- Hydrogen peroxide/acetic acid mixtures. May explode upon heating.
- Hydrogen peroxide/sulfuric acid mixtures. May spontaneously detonate.

Having a household emergency evacuation plan is always a good idea. And, if there is a danger of fire or explosion, get out of the residence immediately. Stay upwind and away from the residence to avoid breathing toxic fumes. It is also important to recognize and respond to symptoms of toxic poisoning including:

- Difficulty breathing
- Irritation of the eyes, skin, throat, or respiratory tract
- Changes in skin color
- Headache or blurred vision
- Dizziness, clumsiness or lack of coordination
- Cramps or diarrhea

If someone is experiencing toxic poisoning symptoms or has been exposed to a household chemical, call the national poison control center at 1 (800) 222-1222 and find any containers of the substance that are readily available in order to provide requested information.

Follow the emergency operator or dispatcher's first aid instructions carefully. The first aid advice found on containers may be out of date or inappropriate. Do not give anything by mouth unless advised to do so by a medical professional.

**Look up at the stars and not down at your feet. Try to make sense of what you see, and wonder about what makes the universe exist. Be curious.** - Stephen Hawking

