Potentially Explosive Materials are reactive chemicals or substances that can explode or enter violent reactions releasing large amounts of light, heat, and/or gases. Reactive Materials are defined by the following four categories:

- **Explosives** are substances that can detonate or decompose rapidly and violently at room temperatures. Gentle heat, light, mild shock, and chemical action can initiate these explosive reactions. Potential peroxide-forming chemicals such as Tetrahydrofuran, ethers, Acetaldehyde, Picric Acid, and 1,4-dioxane are a few examples of Explosive Materials.
- **Strong Oxidizing Agents** are capable of detonation or explosive decomposition under conditions of strong heat, confinement, or a strong shock. Perchlorates, inorganic nitrates, chlorates, chromates and the halogens are examples of some strong oxidizing agent groups.
- **Water Reactives** are chemicals that combine with water or moisture in the air to produce heat, flammable explosive or toxic gases. These chemicals present a severe fire hazard because sufficient heat is often released to self-ignite the chemical or ignite nearby combustibles. In addition, contact with the skin can cause severe thermal and alkali burns. Examples of some water reactive groups are strong acids and bases, alkali metals (sodium & potassium, hydrides, & carbides).
- **Air Reactive**s ignite spontaneously in air at temperatures below 130 degrees F. Finely divided metal powders that do not have a protective oxide coat may ignite when a specfic surface area is exceeded. The degree of reaction depends on the size of the particle, its distribution, and surface area. Examples of some air reactive chemicals are white phosphorus, fine zirconium powder and activated zinc.

- Picrics originating at less than 10% hydration;
- Perchlorates;
- Peroxides;
- Potential peroxide-forming materials;
- Polymerizing chemicals that react violently in polymerization or become hazardous after polymerization; and
- Any other material stored or used which are known to deteriorate or to become unstable or reactive.

Picric Acid

Picric acid (2,4,-trinitrophenol) is common in laboratories. It is normally sold containing 10 to 15% water in a plastic-capped glass container and, in this state, is relatively safe to handle. Dry picric acid, however, can explode when exposed to friction, shock, or sudden heating. Moreover, picric acid can form salts on contact with metals, and heavy metal picrates are highly sensitive to detonation.

Procedures

If you have relatively fresh picric acid which is clearly still wetted, simply follow the instructions for regular hazardous waste.

If you have picric acid that appears to be dried out or in a metal-capped container, call OEHS. A

staff will come to your laboratory to assess the condition of the picric acid and perform the necessary steps to remove the container from your laboratory.

CAUTION: Do not attempt to open a container of dry picric acid!

Pyrophoric Chemicals

Grignard reagents, RMgX Metal alkyls and aryls, RLi, RNa, R3Al, R2Zn, e.g. trimethyl aluminum Metal carbonyls, such as $Ni(CO)_4$, $Fe(CO)_5$, $Co_2(CO)_8$ Alkali metals such as Na, K Metal powders, such as Al, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn, Zn, Zr Metal hydrides, such as NaH, $LiAlH_4$ Nonmetal hydrides, such as B_2H_6 and other boranes, PH_3, AsH_3 Nonmetal alkyls, such as R_3B, R_3P, R_3As Phosphorus (white)

Shock-Sensitive Compounds
Some chemicals identified as shock sensitive have the potential to produce a violent explosion when subjected to shock, heat or friction, and require water to be added to the chemical before transportation.

Shock-Sensitive Compounds

1. Acetylenic compounds, especially polyacetylenes, haloacetylenes, and heavy metal salts of acetylenes (copper, silver, and mercury salts are particularly sensitive)
2. Acyl nitrates
3. Alkyl nitrates, particularly polyol nitrates such as nitrocellulose and nitroglycerine
4. Alkyl and acyl nitrites
5. Alkyl perchlorates
6. Amminemetal oxosalts: metal compounds with coordinated ammonia, hydrazine, or similar nitrogenous donors and ionic perchlorate, nitrate, permanganate, or other oxidizing group
7. Azides, including metal, nonmetal, and organic azides
8. Chlorite salts of metals, such as AgClO2 and Hg(ClO2) 2
9. Diazo compounds such as CH2N2
10. Diazonium salts, when dry
11. Fulminates such as mercury fulminate (Hg(CNO) 2)
12. Hydrogen peroxide becomes increasingly treacherous as the concentration rises above 30%, forming explosive mixtures with organic materials and decomposing violently in the presence of traces of transition metals
13. N-Halogen compounds such as difluoroamino compounds and halogen azides
14. Oxo salts of nitrogenous bases: perchlorates, dichromates, nitrates, iodates, chlorites, chlorates, and permanganates of ammonia, amines, hydroxylamine, guanidine, etc.
15. Perchlorate salts. Most metal, nonmetal, and amine perchlorates can be detonated and may undergo violent reaction in contact with combustible materials.
16. Peroxides and hydroperoxides, organic
17. Peroxides (solid) that crystallize from or are left from evaporation of peroxidizable

solvents

18. Peroxides, transition-metal salts
19. Picrates, especially salts of transition and heavy metals, such as Ni, Pb, Hg, Cu, and Zn
20. Polynitroalkyl compounds such as tetranitromethane and dinitroacetonitrile

Polynitroaromatic compounds, especially polynitro hydrocarbons, phenols, and amines (i.e., dinitrotoluene, trinitrotoluene, and picric acid.

Labeling Requirements for PECs

- All bottles of peroxide-forming chemicals must have the date of delivery and the date of first opening.
- They must be labeled each time they are tested for peroxides with the date and results. Inhibitor must be added if peroxides begin to develop. Peroxide formers must always be disposed of within the manufacturers recommended guidelines. Without this information peroxide forming chemicals are treated as highly reactive.
- Bottles with concentration of peroxide over 100 ppm must be disposed of immediately through OEHS.
- If the concentration of peroxide is under 100 ppm, the bottle may be retained and tested every six months at a minimum.
- Test all peroxide formers prior to distillation, regardless of age.

Storage Requirements for PECs

- Must be kept away from all ignition sources and direct sunlight.
- Storage of PECs in flammable approved safety cabinet or a special designated area is recommended.
- If the peroxide-forming chemical is flammable and requires refrigeration, then an explosion-proof refrigerator must be used.
- Ethers should be stored in amber bottles or other opaque containers and under a blanket of inert gas, such as nitrogen or argon, or over a reducing agent to inhibit formation of peroxides.
- It is recommended to purchase PECs in smaller containers that can be used completely during the experiments rather than purchasing in bulk
- Do not touch or attempt to open containers of a peroxide-forming liquid if there are whitish crystals around the cap and/or in the bottle. If you have such a bottle, contact EHS immediately.