

Appendix II

Reactive Materials

Introduction

The reactivity of any given chemical substance is a characteristic that is strongly influenced by several factors, including the nature of the co-reactant, impurities, catalysts, heat, light, pressure, etc.

Reactive liquids are chemicals that react vigorously with moisture or oxygen or other substances. Reactive solids are chemicals that react vigorously with moisture and other substances. The most common reactive solids include sodium, potassium and lithium metals, acid anhydrides and acid chlorides.

The reactivity of organic compounds may be correlated from a “functional group” point of view (e.g., alcohols, alkyl halides, amines, etc.)

The reactivity of inorganic compounds may be frequently correlated with their “family” in the periodic table. Within a given family, similar types of behavior are observed with changes in the magnitude of reactivity varying consistently with atomic weight. The reactivity of chemical compounds shows a similar correlation for a given class of compounds (e.g., the behavior of the hydrogen halides).

Handling Requirements

- Work only with materials after having examined their MSDS to consider their flammability, reactivity, corrosivity, and toxicity.
- Never combine chemicals indiscriminately.
- Materials labeled pyrophoric must be handled in an inert atmosphere.
- Quench alkali metal and metal hydride containing chemical reactions with an appropriate alcohol prior to adding water.

- Do not combine nitric acid in unfamiliar combinations with organic compounds.
- Never allow hydrogenation catalysts to become completely dry during laboratory operations.
- Always add acid to water, never water to acid.
- All chemical must be transported in a plastic bucket or other unbreakable secondary container, regardless of the size or composition of the primary container. If a cart with sides is used, no bucket is necessary.

Handling Guidelines

- Reactive chemicals should be used in a properly ventilated enclosure.
- Unfamiliar chemical combinations should be treated as if the potential for explosion exists. Use a blast shield and try the reaction on a very small scale the first time.
- Only clean glassware should be used.
- Use caution in cleaning laboratory equipment, which may contain reaction residues.
- Be aware of the potential for delayed or accelerating chemical reactions.
- Check all ethers for the presence of peroxides as appropriate.
- Add strong acids or bases very cautiously to any organic substrate.

Additional information

1. Identifying Chemical Reactivity Hazards: Preliminary Screening Method

<http://www.epa.gov/swercepp/web/docs/chem/flowchart.pdf>

2. A Checklist for Inherently Safer Chemical Reaction Process Design and Operation

<http://www.aiche.org/uploadedFiles/CCPS/Publications/SafetyAlerts/CCPSAlertChecklist.pdf>

3. Dangerously Reactive Liquids and Solids and their Hazards

<http://www.ccohs.ca/oshanswers/chemicals/reactive/react.html>

4. **Reactive Material Hazards**

<http://www.aiche.org/uploadedFiles/CCPS/Resources/SafetyAlerts/reactmat.pdf>

5. *Essential Practices for Managing Chemical Reactivity Hazards*