

EE-527: MicroFabrication

Chemical Storage and Labeling

Chemical Precaution Codes

A	Acid	N	Narcotic
B	Base	O	Oxidizer
C	Corrosive	P	Pyrophoric
D	Dizziness & Drowsiness	Q	Heat Sensitive
E	Explosive	R	Radioactive
F	Flammable	S	Solid
G	Compressed Gas	T	Toxic
H	Hygroscopic	U	Ultrahigh Purity
I	Irritant	V	Contents under Vacuum
J	Etiological Agent	W	Water Reactive
K	Carcinogenic	X	Asphyxiant
L	Liquid	Y	Vibration Sensitive
M	Light Sensitive	Z	Static Sensitive

Chemical Grades and Purity - 1

- Commercial or Technical Grade
 - typically 85-90 % purity
 - rarely used in the laboratory
- Practical Grade
 - small step above technical grade
 - often contain intermediate compounds as part of the preparation process
- United States Pharmacopoeia (USP) Grade
 - suitable for drug use
 - generally acceptable for chemistry lab work
- Chemically Pure (CP) Grade
 - almost as pure as reagent grade, but application determines whether purity is adequate for the purpose

Chemical Grades and Purity - 2

- Spectroscopic Grade
 - purity determined by optical absorption at particular wavelengths
 - usually around 99 % purity
 - used for IR, VIS, & UV spectrophotometry
- Chromatography Grade
 - minimum of 99 % purity with no single impurity over 0.2 %
- Reagent Analyzed or Reagent Grade
 - certified to have impurities below specific levels set by the Committee on Analytical Reagents of the American Chemical Society (ACS)
 - bottles are identified by a batch number
 - minimum standard for any chemical analysis work

Chemical Grades and Purity - 3

- **Electronic or Semiconductor Grade**
 - specified to contain less than set levels of specific impurities:
 - Na, K, Ca, Mg, etc.
 - common subdivisions are:
 - Low-Sodium MOS Grade
 - Low-Sodium CMOS Grade
- **Primary Standard Grade**
 - at least 99.95 % purity
 - can serve as reference standards in analytical procedures
- **Ultra-High Purity Grade**
 - usually solids that have been successively refined
 - expressed as number of nines of purity, e.g. 5-9s = 99.999 % purity
 - highest possible purity of any material

Chemical Labeling

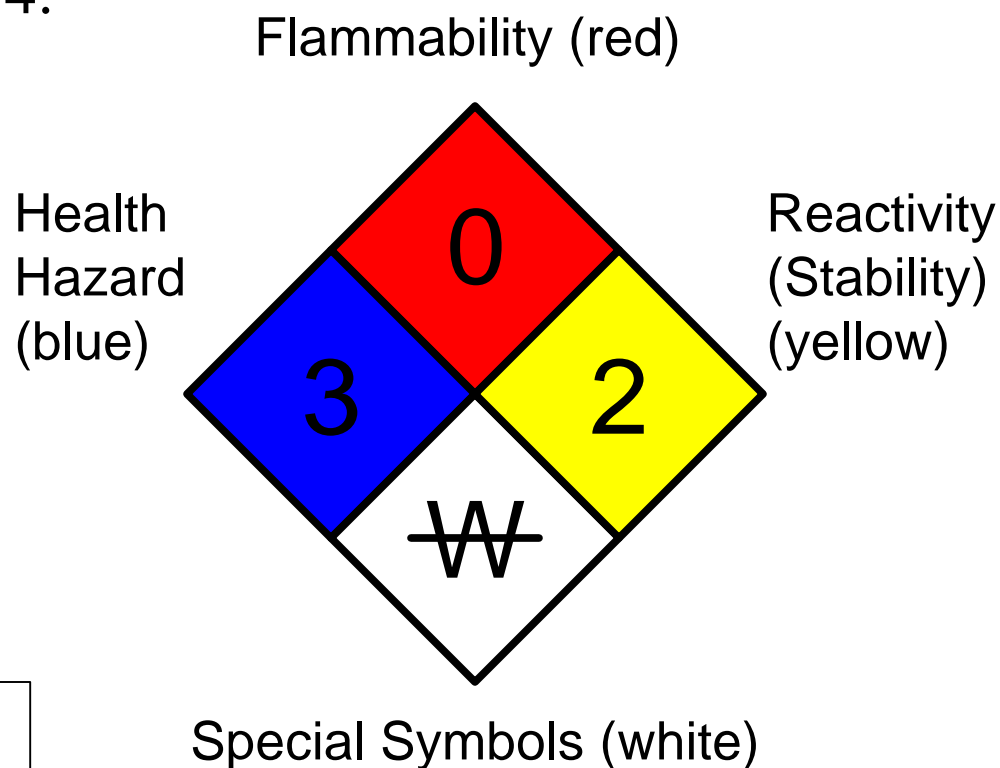
- Primary Labeling
 - printed on containers by the manufacturer
 - specific information is set by Federal Lab Safety Standard (FLSS)
- Secondary Labeling
 - used to label smaller, secondary containers
 - must be done by user to provide point-of-use information
 - must contain:
 - common or scientific name of chemical
 - name of person who is responsible for it
 - date at which container was filled
 - any specific precautions; minimum is NFPA 704M symbol

DOT/United Nations Hazard Classes

- | | | |
|-----------|-----------------------|------------------------------|
| – Class-1 | Explosives | Class A, B, C |
| – Class-2 | Compressed Gases | Flammable, Nonflammable |
| – Class-3 | Flammable Liquids | |
| – Class-4 | Flammable Solids | |
| – Class-5 | Oxidizing Materials | Oxidizers, Organic Peroxides |
| – Class-6 | Poisonous Materials | Class A, B |
| – | Irritating Materials | Domestic, Import/Export |
| – Class-7 | Radioactive Materials | Class I, II, III |
| – Class-8 | Corrosive Materials | |
| – Class-9 | Miscellaneous Hazards | |
- Each has standard international placards that must label any material for transportation

NFPA 704M Labeling System

- National Fire Protection Association (NFPA)
- Hazard Ratings; 0 to 4:
 - 0 none
 - 1 slight
 - 2 significant
 - 3 severe
 - 4 extreme
- Example: H_2SO_4 :



Some manufacturers, e.g. Baker, use the fourth (white) position to indicate immediate contact hazard

Secondary Labeling Methods in the Lab

- Solvent wash bottles
 - Use the pre-labeled polypropylene squirt bottles and just refill then when needed.
- Glass beakers
 - For long term use in the same process, use a Sharpie felt marker on the white labeling area, or create a tape label and apply this to the beaker. Tape labels will resist most chemicals, solvents will dissolve the Sharpie felt tip marks.
 - For short term use, label a filter paper and place the beaker over top of it to identify it.
- Screw cap chemical bottles
 - Use a clean, new bottle and put a pressure sensitive label on it, or use tape labels.