



**Figure 1: Damaged Clothing of a researcher mixing incompatible chemicals**

### **3.4.2 Flammables**

Flammable materials include aerosols, gases, liquids, and solids. In most laboratory situations, gases, liquids, and solids will be the main concern. Flammable gases are defined by OSHA to be “(A) a gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13% by volume or less; or (B) a gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit.” Flammable liquids mean any liquid having a flashpoint below 100°F. Flammable solid means “a solid, other than a blasting agent or explosive, that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or which burns so vigorously and persistently as to create a serious hazard.” The Safety Data Sheet is a good source for determining if a chemical is flammable. In addition, most flammable substances are labeled as such.

For the purpose of this manual we will define a solvent as any flammable or combustible liquid with a flash point below 200°F. The flash point of a liquid is the lowest temperature at which a liquid gives off vapor at such a rate to form an air & vapor mixture that will ignite, but will not sustain ignition. Flammable liquids are indeed the most common chemicals found in a laboratory. It is the vapor of a flammable liquid, not the liquid itself that ignites and causes a fire.

Examples of flammable liquids with flashpoint less than 100°F: All alcohols, acetone, acetaldehyde, acetonitrile, amyl acetate, benzene, cyclohexane, dimethyldichlorosilane, dioxane, diethyl ether, ethyl acetate, histoclad, hexane, hydrazine, methyl butane, picolene, piperidine, pyridine, some scintillation liquids, all silanes, tetrahydrofuran, toluene, triethylamine, and xylene.

- Any solvent not in a flammable liquid storage cabinet or safety can is considered to be unprotected.
- A flammable cabinet is a metal cabinet meeting the design and construction requirements of NFPA 30 and have been tested and listed by third parties like Factory Mutual Laboratories.

- Glass containers storing flammables should be limited to 1 pint in size whenever practical. When not in use, they should be stored in a flammable liquid storage cabinet.
- Transferring of solvents should always be done in a laboratory hood or an approved bulk storage room.
- Flammable liquid storage cabinets shall not be located near exit doorways, stairways, or in a location that would impede egress.
- Flammable liquid storage cabinets must not be wall mounted or stored on top of benches. Installation of any compact wall mounted cabinets should be approved by the department of Environmental Health, Safety and Risk Management.
- Laboratory design must ensure that flammable liquid storage cabinets are not located near an open flame or other ignition source.
- When flammable or combustible liquids present multiple hazards, the laboratory shall address the storage requirements for each hazard. Example: Acetic acid which is a corrosive and flammable material, when stored in a flammable cabinet with other flammable materials; it must be segregated through the use of separate barriers like secondary containment.
- Incompatible flammable materials should not be stored within the same cabinet.
- Minimize the amount of flammables stored in the lab.
- Never store flammable chemicals in a standard household refrigerator.

Flammable liquid storage cabinets shall be conspicuously labeled in red letters on contrasting background “FLAMMABLE – KEEP FIRE AWAY.” In other cases, the labeling should at least clearly and highly visibly indicate that the cabinet has flammable materials and thus is a fire hazard.