



Chemical Safety

Module 6



Health & Safety
Essentials

Registered charity number 207890

Use, storage, handling and transport in the laboratory

Review of Chemical Safety

Chemical safety and dangerous substances have always been a focus of attention as people's lives have been put at risk or lost due to fires, explosions and chemical releases.

Common causes of incidents, resulting in fatalities and injury have resulted from:

- **Lack of awareness of the properties of materials, their storage requirements, use, handling, decanting or disposal arrangements. Lack of understanding of the process, control of ignition sources, adequate design, maintenance and installation of equipment. Lack of training and operator error has also been a factor.**

Awareness training and instruction of reactive chemical hazards and explosions is highly recommended.

Generally the Health and Safety at Work etc Act makes provision for the safe handling, transport and use of articles and substances.

Classification of chemicals⁷

The classification of chemicals⁷ is an identification system that allows you to understand how the chemicals that you are using can cause harm to yourself, others or the environment. It allows for the correct identification of hazards, labelling and information on their safe use, handling and storage will be included in the safety data sheet available from the supplier.

Dangerous substances include substances, preparations and dusts with the potential to give rise to fires, explosions and similar energetic (energy releasing) events (such as runaway exothermic reactions) that can affect the safety of laboratory persons and others.

Control of hazardous operations

A number of operations may be undertaken in laboratories that give rise to explosions, these may involve reactions at high pressures, high temperatures and oxidation reactions. You should keep oxidation work scale to as low as possible, and know the flammable limits of gaseous mixtures.

Inherently safe design of chemical processes

When assessing a chemical process, making the reaction as inherently safe as possible is part of lowering the risk to health and safety from the process. This will involve use of smaller quantities of hazardous materials, the use of a less hazardous material, alternative reaction routes and process conditions that reduce the risk of runaway exothermic reactions, fires, explosions and the release or generation of toxic materials.

The primary legislation applied to the control of substances in the laboratory workplace that can cause fires and explosions is the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR³). This requires a risk assessment, and consideration of eliminating or reducing the risk 'so far as is reasonably practicable'.



When conducting a risk assessment the same '5 steps to risk assessment' approach as recommended by the Health and Safety Executive (as given in Health & Safety Essentials - Risk Assessment) can be used for chemical safety, dangerous substances and explosive atmospheres assessments.

Hazardous Areas can be classified into zones, according to the following:

Zones 0, 1 and 2 are used for explosive atmospheres formed of **flammable gases, vapours or mists**.

Zones 20, 21 and 22 are used for explosive atmospheres formed of **combustible dusts**.

With hazardous areas and dangerous substances that have a fire and explosion risk, it is generally an expectation that maintenance operations **must** be carried out under a 'Permit to Work System'.¹⁰ This will be documented and include the nature and location of the work, identify the hazards, and any residual hazards, and any extra hazards introduced by the work itself.

Storage

Careful consideration should be made of storage condition requirements, and this should include ignition potential and any escalation of an incident. You will find the requirements for safe storage listed on the suppliers Safety Data Sheet, and it will give advice on special storage conditions, temperature limitations, and sensitivity to impact.