Cryogenic products : storage and handling

Storage and warehousing :

Refrigerated chemicals (liquid nitrogen, liquid air, dry ice) are used as refrigerants. They are stored in Dewar containers ensuring an excellent thermal insulation.

There is a risk of suffocation !

Cryogenic liquids must not be stored in confined spaces. The storage of large quantities must be done outside buildings. If an outdoor storage is not possible, it is recommended that the facility is equipped with a probe measuring the rate of oxygen (oximetric detector) as well as a permanent ventilation.

Considering the risk of suffocation in case of failure, it is forbidden take the elevator with a Dewar-type container (or tank) containing cryogenic chemicals !

It is required to place the container alone in the elevator, then receive it at the floor desired, making sure that nobody may take the lift with the container.

Cryogenic liquids must not be stored in closed containers, equipped with a sealing plug (or hermetically), nor in a thermos bottle. Indeed, if the container is closed tightly, the gas then can't escape; so there is risk of explosion.

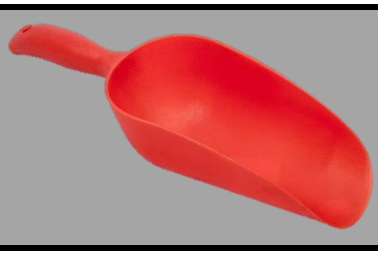
Polystyrene ("Sagex") is not suitable for the storage and handling of cryogenic products. Use containers made especially for this purpose (e.g. vacuum double coat).

Handling :

The use of cryogenic chemicals and cryogenic baths (liquid nitrogen, solvent + dry ice or solvent + liquid nitrogen) requires special handling precautions. Indeed, as liquid nitrogen has a temperature of - 196 °C and dry ice (pure solid CO_2) of -78.5 ° C, these products present an important risk of frost injury (burns from cold), in addition to the risk of suffocation due to the evaporation or sublimation of the compounds.

Handling of cryogenic products requires, in addition to wearing the lab coat and safety glasses (or goggles), the use of protective gloves against cold.

A small plastic shovel is necessary when handling dry ice.



The introduction of material in liquid nitrogen or in a cooling bath must be made slowly, progressively and using clamps. Indeed, a risk of sudden boil or splash of cryogenic fluid is possible when we plunge a hot (or at ambient temperature) object into a cryogenic bath.

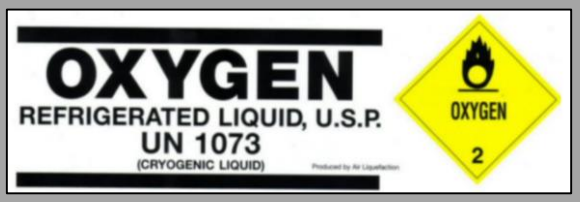
The evaporation of the liquid can reduce the oxygen in the atmosphere (liquid nitrogen) or contaminate the atmosphere of the work place (e.g.: acetone + dry ice). Ensure that the ventilation of the working place is adequate.

Pouring of cryogenic liquid must also be carried out slowly to avoid thermal shocks.

If possible, handle the cryogenic fluid under a hood !

NOTES ON THE RISK OF EXPLOSION :

- Liquid cryogens such as liquid nitrogen, which has a boiling point lower than that of oxygen (-195 °C vs -183 °C) can condense the ambient oxygen by cooling it. After several repeated refills, it is likely that liquid oxygen accumulated in the container, with the risks associated with oxygen! The same phenomenon can occur outside the pipes containing the cryogenic liquid through condensation of the oxygen of the air.



- The warming of liquid nitrogen is done with an expansion by a factor 1: 696 (1 L liquid nitrogen generates approx. 700L of gaseous nitrogen, i.e. approx. 0.7 m3). Accordingly, the containers used to store liquid nitrogen must be open and not pressurized (such as the Dewar ones) and fitted with a safety valve to evacuate the overpressure.

  Therefore, ensure that there is no ice formation at the level of the Dewar safety valve

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