

Safety instructions for working with cryogenic nitrogen

1. The main risks of working with liquid nitrogen

1.1 Frostbite - Cryogenic nitrogen can cause cold burns and organs' adhesion when in contact with body tissues.

1.2 Suffocation - A liquid spill or a gas leak from a cryogenic nitrogen tank in large quantities can cause a drop in the oxygen concentration in the room space, while a drop in oxygen concentration below 19% poses a risk of fainting and suffocation.

1.3 High pressure - The liquid nitrogen inside the tank is in a boiling state and releases gas. Sharp temperature transitions can affect tanks under pressure and cause the container to explode. There is also a risk of explosion due to oxygen liquefaction.

2. Personal protective equipment

When transporting cryogenic nitrogen, moving the tank and/or using the material, wear appropriate clothing and wear protective equipment, including:

2.1 Goggles. It is recommended to wear a full-face shield.

2.2 Long-sleeved shirt and/or long-sleeved lab coat. It is also recommended to use a long apron made of cold-resistant material ("cryo-apron"). Be sure to cover the skin in places where there is a possibility of liquid contact with the tissues in order to prevent frostbite.

2.3 Well-insulated protective gloves for working at low temperatures ("cryo-gloves").

2.4 Closed shoes (high safety shoes are recommended).

3. Storage and use instructions

3.1 The liquid nitrogen must be stored in a dedicated thermally insulated container (dewar). Ensure perfect closure of the cryogenic container after use to prevent nitrogen leaks into the laboratory and/or hallway space.

3.2 Use cryogenic nitrogen in a well-ventilated room. Forced ventilation of 6 fresh air changes per hour should be ensured 24 hours a day to avoid choking hazard. Keep in mind that a 50-liter cryogenic nitrogen tank contains up to 15 times more gas than a cylinder of the same volume as nitrogen gas under pressure. An infrastructure adjustment must be done in a room where cryogenic nitrogen containers are stored or used. A corridor in which one or more tanks of cryogenic nitrogen are placed must also be ventilated to the extent of at least 6 fresh air exchanges per hour. In cases where there is no chemical hood in the room or when liquid nitrogen is stored in a room that has a ventilation problem, it is mandatory to install an oxygen detector on site.

3.3 Filling a liquid nitrogen tank will be done by a skilled person who has undergone training on the subject. Filling the tank will be done carefully while slowly moving between the containers. To avoid choking due to gas inhalation, the amount of liquid nitrogen stored in the tank should be minimized.

3.4 In the case of using a pressurized nitrogen tank, check the integrity of the pipes and transit connections before use. It is important to avoid physical damage to the container while moving it. The integrity of the cryogenic nitrogen tanks should be visually examined, and if there are defects and/or the tank is rusty, a professional examiner should be invited. In order to prevent the tank from exploding due to the internal pressure, the tank must have a track that allows the release of gas, in addition to a safety valve designed to allow the release of excess pressure, as well as breakout discs whose function is to operate in the event that the safety valve malfunctions.

3.5 When refrigerating with nitrogen (pure or mixed with organic solvent) – use a thermometer to avoid overcooling. In case of cooling a vacuum system trap, beware of oxygen liquefaction (blue liquid). If blue liquid is observed, evacuate the laboratory room immediately.