

## Don't Get Caught Cold with Liquid Nitrogen!

Liquid nitrogen ( $N_2$ ) has a reputation of being benign. However, being odorless, colorless, tasteless and nonirritating, nitrogen has no warning properties. Humans possess no senses that can detect the presence of  $N_2$ . There are four distinct dangers from liquid  $N_2$ : (1) it can asphyxiate (2) it can cause frost bite, (3) it can condense oxygen and increase flammability and (4) it can explosively release gas.

### Asphyxiation

Under normal circumstances, lab ventilation is usually sufficient to remove an excess of  $N_2$ . However, liquid  $N_2$  and dry ice have caused fatalities after being released in enclosed areas such as cold rooms. A scientist died of suffocation at CSIRO in Australia in December 2001 because of a liquid  $N_2$  leak in a cold room.

### Frost bite

Cold burns result from close contact with liquid  $N_2$ . Small amounts evaporate rapidly with little damage. However, larger amounts will not evaporate before causing burns. The eyes are especially vulnerable

### Oxygen Condensation

Liquid  $N_2$  (B.P.  $-196^\circ\text{C}$ ) is capable of condensing oxygen (B.P.  $-183^\circ\text{C}$ ) from the air causing oxygen enrichment in unsuspected areas. Increased oxygen greatly increases flammability of combustible materials.

### Explosive Release

In a 1.5 mL closed vial, the evaporation of 0.5 g liquid  $N_2$  generates an internal pressure of 4053 psi. Failure of the screw threads turns the cap into a 296 mph projectile!

### Personal Protective Equipment

- full face-shield over safety glasses
- loose-fitting thermal insulated or leather gloves
- long-sleeved shirts and trousers
- preferably safety shoes – at least ensure feet are fully covered

### Remember!

1. If a large spill occurs, leave the room until the liquid is evaporated.
2. Remove soaked clothing immediately.
3. Use loose-fitting gloves so that they can be removed quickly in case of a spill.
4. Serious cold burns should be treated by a doctor.
5. Smaller exposure burns may be treated as a sunburn injury of comparable magnitude. Warm affected skin slowly using COLD water only. Hot water will worsen the injury.

### Did You Know?

#### Rescue in Oxygen- Deficient Atmosphere

*Fiction:* I can hold my breath long enough to rescue a downed coworker

*Fact:* Over 50% of the workers who die in confined spaces are attempting to rescue other workers