Liquid nitrogen (LN_2)

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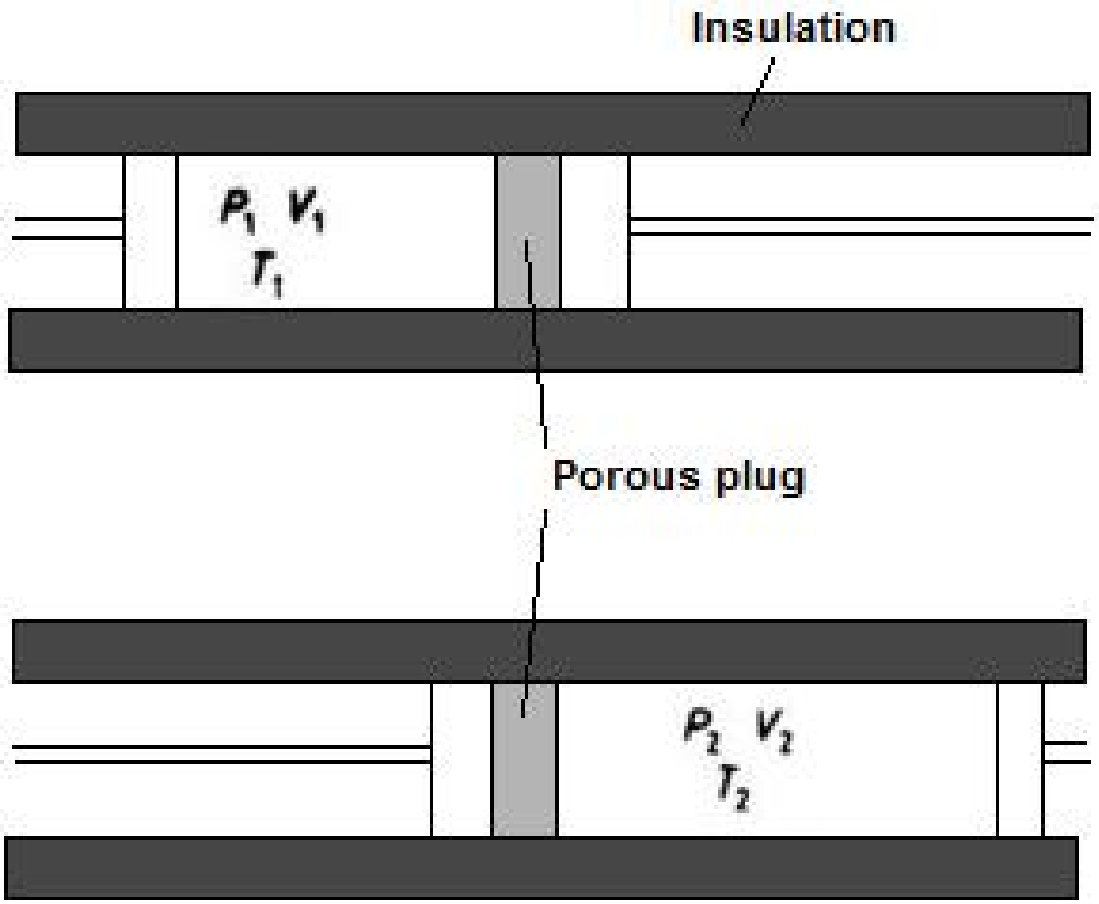
Liquid Nitrogen (LN_2) Facts

- Liquid nitrogen is a colourless clear liquid
- Density: 0.807 g/mL at it's b.p (77 K)
- Freezing point: 63 K
- Dielectric constant: 1.4
- 1 cubic foot of liquid nitrogen will expand to 696 cubic feet of 100% gaseous nitrogen at 21° C
- The nitrogen gas can displace the oxygen in the area, leading to asphyxiation

- LN_2 can cause burn
- Nitrogen was first liquefied at the Jagiellonian University on 15 April 1883 by Polish physicists, Zygmunt Wroblewski and Karol Olszewski

Production

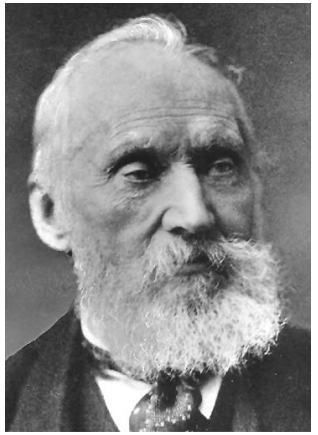
- LN_2 is produced industrially by fractional distillation of liquid air
- Liquid air is produced by Joule-Thomson effect



Zygmunt Florenty Wróblewski

Karol Olszewski

James Joule



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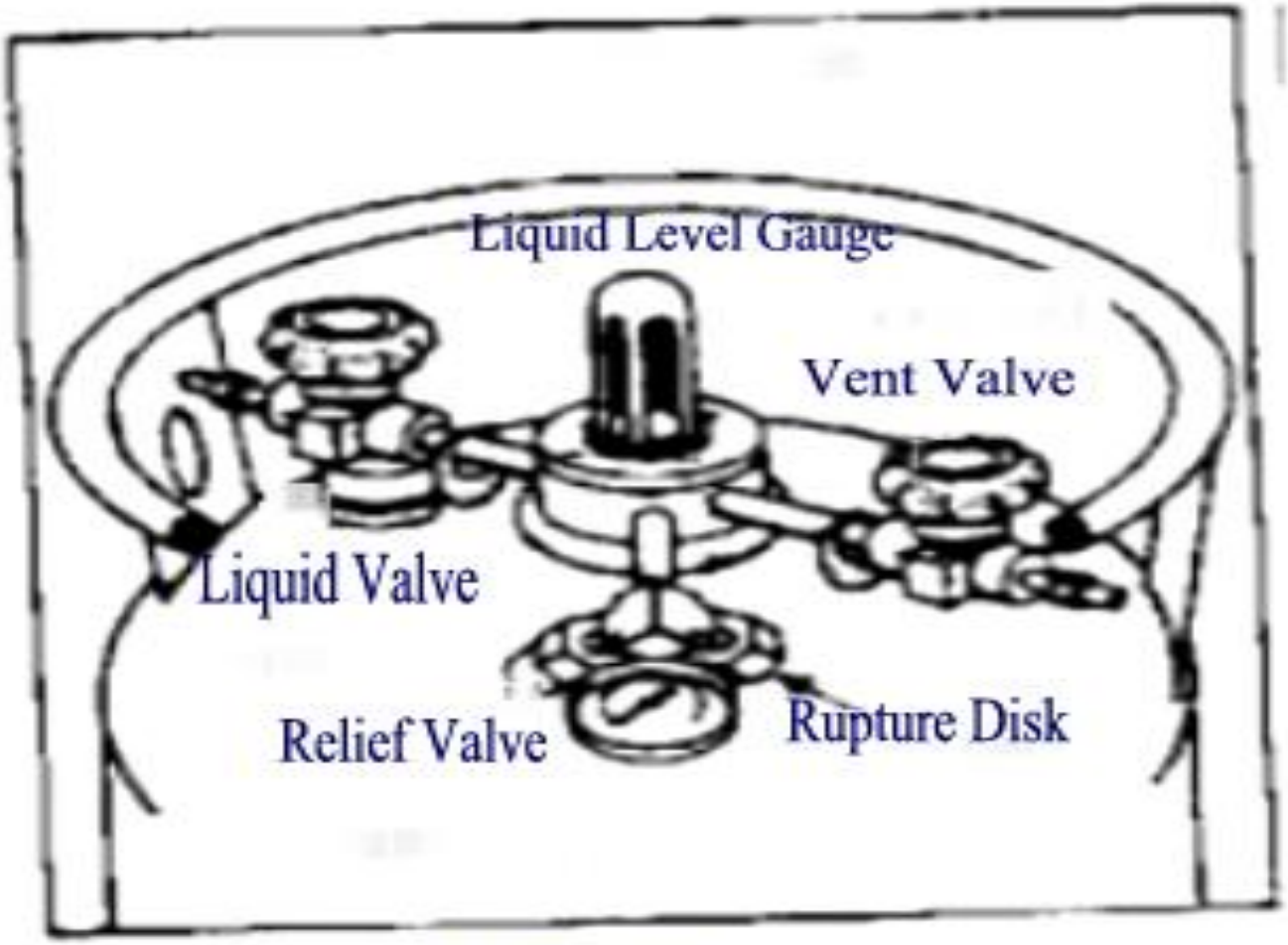
Applications

- As a coolant for CCD cameras, in EDAX detectors of SEM and TEM, etc
- To store cells at low temperature for laboratory work
- In cryogenics
- As a source of very dry nitrogen gas
- For the immersion freezing and transportation of food products
- For the cryopreservation of blood, reproductive cells (sperm and egg), and other biological samples and materials
- As a method of freezing water pipes in order to work on them in situations where a valve is not available to block water flow to the work area
- For cooling a high-temperature superconductor to a temperature sufficient to achieve superconductivity

Precautions

- Always wear thermal protective clothing when handling refrigerated/cryogenic liquids or solids
- It is required you wear a full face shield over safety glasses, loose fitting gauntlet gloves, long sleeve shirts, full-length trousers without cuffs, and fully enclosed shoes
- Only use containers that have been designed specifically for cryogenic liquids
- Do not store in a confined space
- Do not store at temperatures above 52 °C

Appropriate Containers



Low Pressure
Liquid Container
Components

Low Pressure Liquid Container Components

- **Liquid Withdrawal Valve**

  Liquid is withdrawn through this valve

- **Pressure Gauge**

  Displays internal pressure of the container

- **Contents Gauge**

  A float-type liquid level gauge-indicates approximate level of liquid

- **Vent Valve**

  Primarily used in the fill process to vent the vapor space while filling. Can be used to vent unwanted pressure during storage and use

- **Pressure Relief Device**

  Protect vessel from over-pressurization

- Liquid is converted to gas at about 2.3% per day even under ideal container conditions
- If the liquid is not used regularly, the vessel will be empty in a certain amount of time

Inappropriate Containers

- DO NOT use open, un-insulated or glass containers!

Emergencies

- If there is a large spill or rupture of a container, warn others in building
- **Evacuate!! There may be oxygen deficiency in the area of the spill!!**
- If there is injury to the body from liquid nitrogen, seek immediate medical assistance

Please be SAFE

THANKS