

HIGH PRESSURE CARBON DIOXIDE: A NON-THERMAL PRESERVATION METHOD

DID YOU KNOW?

HIGH PRESSURE CARBON DIOXIDE METHOD (HPCD)

- ✓ Non-thermal novel technology with the application of CO₂ at high pressure
- ✓ Valuable method for improved food quality and human nutrition by inactivating microorganisms and some food-related enzymes
- This technology has yet to be developed at industrial scale!

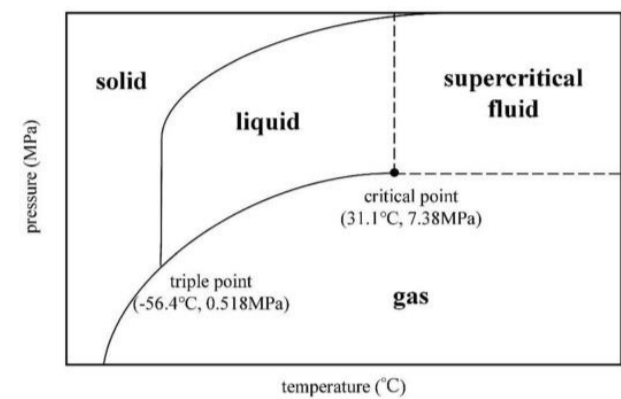


Fig. 1. Pressure-temperature phase diagram for CO₂

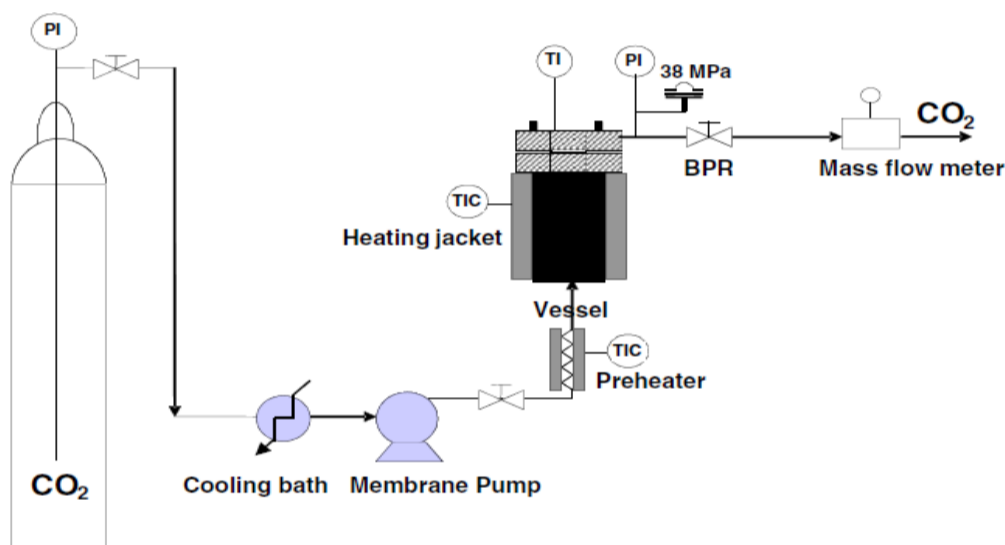


Fig. 2. HPCD installation. PI: Pressure indicator; TI: temperatura indicator; TIC: temperature indicator and controller; BPR: final pressure regulator
(Source: DOI:10.1016/j.ijfoodmicro.2012.02.015)

HOW IT WORKS?

- ⚙ The product to be treated is placed in a container and the CO₂ passes under different operating conditions for different periods of time.
- ⚙ CO₂ expel the oxygen vital to harmful microorganisms.
- ⚙ It's applied pressure between 0.1 MPa to 50 MPa at room temperatures or above, depending on the target microorganisms.

ADVANTAGES

- ✓ CO₂ is inert, non-toxic, no special handling
- ✓ Easily available and affordable
- ✓ No residues left in the treated product
- ✓ GRAS solvent
- ✓ Less sophisticated equipment comparing with other technology

DISADVANTAGES

- ✗ Some foods can suffer acidification
- ✗ Matrices w/ higher content of lipids & fats decrease the penetration of CO₂
- ✗ Extraction of volatile compounds
- ✗ Changes in color and odor

APPLICATIONS

- ✓ Environment
- ✓ Solid material (polymers, medical instruments)
- ✓ Liquids (foodstuffs and medicines)

PRODUCT PRESERVATION

➤ Efficient in inactivation of a wide range microorganisms:

- Bacteria (Lactic acid bacteria, *Listeria monocytogenes*, *Staphylococcus* spp., Enterobacteria)
- Endospores (combined w/ high temperatures or small amounts of additives) (*Alicyclobacillus acidoterrestris*; *Bacillus* spp.; *Geobacillus stearothermophilus*)

Yeasts and molds

Bacteriophages

➤ Efficient in inactivation of certain enzymes (polyphenol, oxidase, peroxidase)