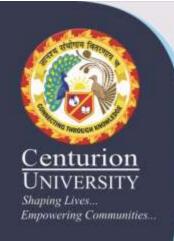
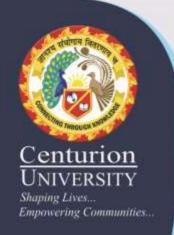


Super Critical Fluid Extraction

Skill Course



Modifiers for SCFE



Need of modifiers

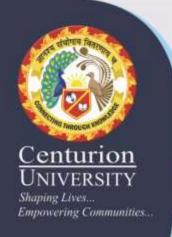
CO₂ is the most used solvent to perform SFE.

Main drawback of CO₂ in natural products extraction is its low polarity.

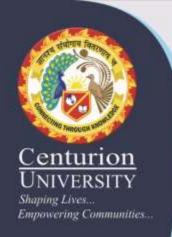
Low polarity limits its ability to extract polar components from the raw material.

Even at high densities (with increased dielectric constant), CO₂ has a limited ability to dissolve high-polarity compounds.

To address this problem, small amounts of cosolvents (modifiers) are added to the CO_2 stream. The addition of modifiers to CO_2 can improve the extraction efficiency by raising the solubility of the solutes.



- ➤ The amount of modifier added to the supercritical fluid should be lower than 10–15%.
- The most used modifiers are methanol, ethanol, and water.
- ➤ The critical point of the mixture (CO₂:modifier) is different than that of pure compounds.
- ➤ It also depends on the proportions of each of the solvents.

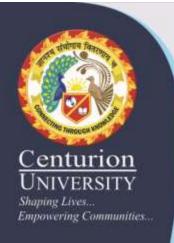


Mechanisms

Two mechanisms have been proposed by Pereira and Meireles to explain the effects

- 1. Solute—co-solvent interactions, caused by increase in solvent polarity;
- 2. Matrix swelling that facilitates the contact of the solute by the solvent

C. Pereira and M. Meireles, Food Bioproc. Technol., 2010, 3, 340.



Disadvantages of modifiers

- Unlike supercritical CO₂ Modifiers are liquids at room conditions.
- ➤ So, liquid residues are obtained in extracts and remaining matrix after SFE.
- Modifiers like methanol should not be used in the extraction of natural products since this is a toxic solvent
- ➤ It can prevent the further use of the extracts, for instance, in food applications.
- ➤ Water as a modifier has several drawbacks such as the formation of ice blockages due to the Joule— Thompson effect in the separator vessel.
- Possibility of ionization and hydrolysis of compounds.
- ➤ Foam formation by reacting with saponins present in plant materials.