

## Topics and Applications of Supercritical Fluids

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**Abstract:** Supercritical fluids are fluids that are above a chemical species critical temperature and pressure. In considering a pure component's phase diagram, as pressure and temperature increase along the liquid-vapor phase boundary, the dielectric constant of the fluid decreases. Above the critical point, a fluid will fill a container and pass through solids like a gas but have a density similar to a liquid. Likewise a supercritical fluid will have a high diffusivity. Owing to a low dielectric constant, supercritical fluids are non-polar. For example, for water, hydrogen bonding is disrupted, and water can readily dissolve non-polar organic compounds and oxygen, whereas salts are insoluble. Due to the unique solvent properties, common supercritical fluids carbon dioxide ( $T_c=304$  K,  $P_c=7.38$  MPa), ethanol (513.9 K, 6.14 MPa), and water (647 K, 22.1 MPa), are used in industrial applications ranging from extraction of compounds from plant materials, dry cleaning, biodiesel production, polymer processing, power generation, and partial oxidation. In addition, chemical species may be mixed to create binary and ternary solvent mixtures with varying properties and solubility. Due to being environmentally-benign, supercritical fluids make for attractive replacement solvents of hydrocarbons for several chemical processes. The proposed course will introduce the topic of supercritical fluids including thermodynamics and fluid phase behavior, the fabrication and operation of supercritical fluid and high pressure systems, and special applications of supercritical fluids.

### Course Topics

1. Introduction to Supercritical Fluids: Properties and Thermodynamics
2. Safety in use of Supercritical Fluids
3. Fabrication and Operation of Supercritical Fluid Processing Systems
4. Applications of Supercritical Fluids
  - a. Production of fluoropolymers
  - b. Infusion, blending, and composite polymeric materials
  - c. Extraction of polyphenolic compounds from plant matter
  - d. Transesterification of vegetable oils to produce biodiesel
  - e. Supercritical water partial oxidation
  - f. Reformation of hydrocarbons
  - g. Additional Topics

<b>Termin</b>	<b>Dzień tygodnia</b>	<b>Godzina</b>	<b>Miejsce</b>
16.10.2017	Poniedziałek	9.15 – 12.00	Minicentrum Konferencyjne (Luwr)
17.10.2017	Wtorek	12.15 – 15.00 <i>/zmiana godziny!!!/</i>	Minicentrum Konferencyjne (Luwr)
18.10.2017	Środa	9.15 – 12.00	Minicentrum Konferencyjne (Luwr)
19.10.2017	Czwartek	9.15 – 12.00	Minicentrum Konferencyjne (Luwr)
20.10.2017	Piątek	9.15 – 12.00	Minicentrum Konferencyjne (Luwr)