**Objective of Research**

- To develop the manufacturing process to produce the defatted food by supercritical carbon dioxide.
- To obtain phase equilibrium data of supercritical carbon dioxide - Oleic acid experimentally.
- To correlate the phase equilibrium data with thermodynamic model.

**Properties of Oleic Acid**

- Unsaturated fatty acid in olive oil, camellia oil, and palm oil.
- Colorless, odorless.
- Insoluble in water, soluble in organic solvent.
- Major component to contribute the acid value of oil.

**Physical Properties of Oleic Acid**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiling point (°C)</td>
<td>360</td>
</tr>
<tr>
<td>Molding point (°C)</td>
<td>13</td>
</tr>
<tr>
<td>Specific gravity (g/ml)</td>
<td>0.899</td>
</tr>
<tr>
<td>Saponification Value (KOH/mg/g)</td>
<td>84 ~ 95</td>
</tr>
<tr>
<td>Viscosity (cP @ 25°C)</td>
<td>1.4449</td>
</tr>
<tr>
<td>Melting point (°C)</td>
<td>302.3</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>198 ~ 207</td>
</tr>
<tr>
<td>Insoluble in water</td>
<td>27.04</td>
</tr>
</tbody>
</table>

**Application of Oleic Acid**

- It is used in the food industry to make synthetic butters and cheeses. It is also used to flavor baked goods, candy, ice cream, cocoa butter of chocolate, medicine, mustard oil, hair treatment and sodas.

**Experimental Apparatus & Experimental Method**

- **Calculation of Procedure**
  - Input \( T, P, x, y \)
  - Obtain \( P_{cal}, y_1 \)
  - Calculate \( \Phi_1 \)
  - Calculate \( V_1 \)
  - Calculate \( \Phi_2 \)
  - Calculate \( V_2 \)
  - Calculate \( y_2 \)
  - Obtain \( P_{cal}, y_2 \)

- **Theoretical Calculation**

- **Objective Function**

- **Peng – Robinson EOS**

- **GC Calibration Data of Oleic Acid**

- **Solubility Variance with Time**

- **Interaction Parameter of P-R EOS**

**Conclusion**

- Mutual solubilities of oleic acid with SCCO₂ were measured in the new circulation type equilibria apparatus.
- The solubilities of oleic acid in SCCO₂ were higher at lower temperature and higher pressure.
- For Oleic acid + carbon dioxide system, the average difference in modeling is 2.65 %.
- The experimental data were correlated with the Peng-Robinson EOS with van der Waals mixing rule. With single binary interaction parameter, reasonable agreements between experimental and calculated data were obtained.