Thesis Title	Solubilities of Gallic Acid and Paracetamol in Supercritical Carbon Dioxide with A Co-solvent
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Abstract

This research aimed to examine the solubilities of gallic acid and paracetamol in supercritical carbon dioxide with a co-solvent. Solubility measurement was performed at carbon dioxide flow rate of 100 mL/min. A central composite design (CCD) was used to design the experiments to investigate the effects of temperature (35 - 85 °C), pressure (8 - 42 MPa) and ethanol concentration (1.31 - 4.68% (v/v)) on the solubility of gallic acid in supercritical carbon dioxide. On the other hand, the solubility of paracetamol was determined at temperatures ranging from 36 to 64 °C and in the pressure range of 11 to 39 MPa. The experimental results were analyzed by using response surface methodology (RSM). Then the experimental solubility of paracetamol in the supercritical carbon dioxide with the ethanol co-solvent was compared to the value predicted from equations of state.

The experimental results showed that the highest value of solubility of gallic acid in the supercritical carbon dioxide with 4% (v/v) ethanol was obtained at the temperature of 75 °C and the pressure of 15 MPa, while the lowest solubility was obtained with the addition of 2% (v/v) ethanol at 45 °C and 35 MPa. Besides, the p-value derived from the RSM indicated that the ethanol concentration was a significant factor affecting the solubility of gallic acid.

The highest value of measured solubility of paracetamol in the supercritical carbon dioxide was achieved by introducing 0.5% (v/v) ethanol at the temperature of 60 °C and the pressure of 35 MPa. On the other hand, the lowest solubility was found at the 50 °C and 11 MPa. Furthermore, the p-value represented that the pressure was the most significant factor affecting the paracetamol solubility.

The experimental data of the paracetamol solubility in the supercritical carbon dioxide with the ethanol co-solvent were correlated using six equations of state (EOS); Mohsen-Nia-Moddaress-Mansoori (MMM), Lee-Kesler-Plocker (LKP), Peng Robinson (PR), Redlich-Kwong (RK), van der Waals (VdW) and Soave-Redlich-Kwong (SRK). The paracetamol solubility in the supercritical carbon dioxide was found to be fairly well described by using the EOS of MMM with an Average Absolute Relative Deviation (AARD) ranging from 6.13 to 13.17 %.

Keywords: Solubility / Supercritical carbon dioxide / Gallic acid / Paracetamol / Response surface methodology / Equation of state