

NON-CONVENTIONAL SUPERCRITICAL FLUIDS AS POTENTIAL SOLVENTS IN EXTRACTION PROCESSES

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Abstract

In the scientific literature the contributions about supercritical fluid phase equilibrium are discussing mostly the systems with conventional supercritical fluids, especially supercritical carbon dioxide, however also investigation of non-conventional supercritical fluids should be taken into consideration. Argon is already widely applied as a protective atmosphere for certain foodstuffs, notably fruits and vegetables, especially when deterioration of food should be slowed down. The inert behavior makes argon a good candidate for a solvent in extraction processes.

Prior to extraction experiments, solubility data of pure vanillin and ortho ethylvanillin as two most interesting compounds of vanilla pods were measured in argon at temperatures of 40 °C, 60 °C and 80 °C and at pressures up to 500 bars. The content of vanillin and ortho ethylvanillin in extracts from vanilla pods was determined after extraction with supercritical fluids; argon as a non-conventional solvent and CO₂ as a well-introduced supercritical fluid at temperatures of 25 °C, 40 °C and 60 °C and at pressures of 150 bars and 300 bars. Extractions using organic solvents (conventional and Soxhlet extraction with methanol and ethanol) were performed to compare the quality of products obtained by both traditional and sustainable ways. Obtained extracts were dissolved in methanol and absorbance was measured at a wavelength of 228.5 nm (vanillin) and at a wavelength of 270 nm (OEV).

Maximal solubility of vanillin in argon is observed at a temperature of 40 °C and a pressure of 438 bars, approx. 0.015 g/g. For OEV highest solubility in argon was measured at pressures above 300 bars and at lower temperatures; about 0.5 g/g. UV analysis show high content of vanillin in extracts, obtained by extraction with supercritical fluids (up to 88 wt.% for vanillin and 76 wt.% for OEV) and 70 wt.% of vanillin and 55 wt.% of OEV in those obtained with Soxhlet or conventional extraction.

Therefore, it can be concluded that supercritical fluids are way more selective solvents for vanillin's than conventional ones.

Key words: Argon, Extraction, Vanillin, o-ethylvanilin.