

Concentration of Minor Components in Crude Palm Oil

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This study deals with the enrichment of minor constituents mainly tocochromanols and carotenoids from crude palm oil with supercritical carbon dioxide. Tocochromanols (tocopherols and tocotrienols) are well recognized for their antioxidative effects. Carotenes, in particular β -carotene, have long been known for their provitamin A activity, as they can be transformed into vitamin A in vivo. The starting material in this work was crude palm oil, which has a concentration of free fatty acids up to 4%, 600 ppm tocochromanols and 500 ppm carotenoids. The main components of crude palm oil, i.e. triglycerides were transesterified since fatty acid esters has a solubility magnitudes higher than triglyceride in CO_2 . The free fatty acids were first separated, and the crude palm oil was then transesterified to fatty ester methyl esters (FAMES) with methanol using base catalyst. Afterwards, the glycerol was separated and the product was washed with water to remove catalyst and methanol. In a pilot countercurrent supercritical fluid extraction (SFE) apparatus, which was built according to the mixer settler principle [1], fatty acid methyl esters were extracted at 60 °C and 140 bar. The process was realized with a CO_2 flow rate of 20 kg/h. The five-stage mixer-settler apparatus achieved approximately four theoretical separation stages. After three steps of extraction, an enrichment of 200-fold for carotenoids and 100-fold for tocochromanols was found [2, 3]. It is demonstrated that SFE can be an alternative method to recover minor constituents in crude palm oil.

[1] PIETZONKA W., 1997, Mehrstufige Gegenstromapparatur nach dem Mixer-Settler-Prinzip für die Extraktion mit überkritischen Fluiden, ETH Zürich, PhD thesis.

[2] CHUANG M.-H., BRUNNER G., 2006, Concentration of minor components in crude palm oil, Journal of Supercritical Fluids 37: 151-156.

[3] CHUANG M.-H., 2007, Enrichment of Vitamin E and Provitamin A from crude Palm Oil with Supercritical Fluids, Technische Universität Hamburg-Harburg, PhD thesis.