Abstract Book

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Coaxial Microwave Assisted Hydro-Distillation of Essential Oils

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Abstract

Coaxial microwave assisted hydro-distillation of essential oils from lavender, sage, rosemary, fennel seed and clove bud essential has been carried out using a Clevenger-type device. Microwaves where applied by means of a coaxial antenna and reference extractions have been carried out by conventional hydro-distillation. The yield and chemical composition of essential oils were analysed as a function of the microwave extraction time. A complete chemical characterization and thermal behaviour and stability was performed by several techniques: gas chromatography, gas chromatography, mass spectrometry and thermogravimetry coupled to infrared spectrometry. The coaxial microwave assisted extraction leads to a high concentration of oxygenated monoterpenes, different product selectivity, energy savings, and reductions in heating time compared to the conventional extraction process. The coaxial antenna approach allows an easy industrial scale-up, without any limit of power and size.

Biography

Carlo Ferrari is researcher at the INO-CNR since 2002. He has been Intensity Frontier Fellows at Fermilab in 2017/18. He has published more than 75 papers in reputed journals.

High-Pressure Phase Transitions and Thermophysical Parameters of Camelina Sativa Oil Investigated by Ultrasonic Methods

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Abstract

Knowledge of high-pressure behavior of the processed liquids is necessary to control technological processes in many branches of industry (e.g., in chemical, pharmaceutical and food industries). However, data on high-pressure behavior of liquids are still incomplete. The aim of this study is to investigate the high-pressure behaviour (i.e., thermo-pysical parameters and possible high-pressure phase transitions) of liquids (on the example of Camelina sativa oil), applying ultrasonic methods (i.e., sound velocity and parallel density measurements). Camelina sativa (false flax) oil has found application in many branches of industry as well as a raw material for biofuel production. Generally, conventional methods for measuring thermophysical properties of liquids fail at high pressures. The solution to the problem can be the use of ultrasonic methods. Ultrasonic measurements were performed at f = 5 MHz for pressures 0.1 - 660 MPa, and for temperatures 3 - 30°C. Pronounced high-pressure phase transitions were discovered by the authors in Camelina sativa oil. The use of ultrasonic methods has enabled the determination of many physicochemical parameters of Camelina sativa oil, such as: 1) adiabatic compressibility β_a, 2) thermal expansion coefficient α_p, 3) specific heat at constant pressure c_p, 4) thermal conductivity k and 5) thermal diffusivity α. The results obtained in this study are novel and can be employed to design and control technological processes in many branches of industry.

Biography

Dr Piotr Kiełczyński works as a professor at Institute of Fundamental Technological Research (IPPT) of Polish Academy of Sciences (PAN) in Warsaw, Poland. He is the head of the Laboratory of Acousto-electronics. His research interest includes: surface and bulk acoustic waves, high-pressure properties of liquids, ultrasonic sensors, numerical simulations, mathematical modelling. Dr Kiełczyński published about 100 research papers, worked as an invited scientist in many Universities in Europe, USA and Japan. Dr Kiełczyński is an author of three book chapters,

Published in Europe and USA. He presented the results of his research as an invited speaker in many international conferences.