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Preface

Attila R. Imre[1], Edit Székely[2]

[1] co-organiser of the conference, Department of Energy Engineering, Faculty of Mechanical Engineering, Budapest University of Technology and Economics
[2] organizer of the conference, guest editor of this issue, Department of Chemical and Environmental Process Engineering, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology and Economics

This issue of the Periodica Polytechnica Chemical Engineering is devoted to contributions in connection with the Applications of Supercritical Fluids 2018 conference, which was held at the Budapest University of Technology and Economics, Budapest, Hungary on 17 May, 2018. This was the 8th conference of the series initiated by Prof Béla Simándi in 1996.

A substance is called a supercritical fluid at temperatures and pressures above the critical point of the given substance. However, for practical applications, instead of this thermodynamics based definition, the term supercritical is used in a much wider meaning and includes near-critical fluids, compressible liquids, pressurized gases, expanded liquids etc., based on their common behavior resulting from the relative proximity of the critical point of the main component of the mixture. When the pressure and temperature of solvents or their mixtures are relatively close to the critical point of the solvent we obtain a phase with largely variable properties; density, solvent power, diffusion coefficient, specific heat capacity, dielectric constant, viscosity etc. can be changed even by orders of magnitude by a simple modification of process parameters like pressure and temperature. Applications of supercritical fluids nowadays are very diverse. Extraction of solid matrices, typically plants and the de-asphalting of vacuum residue of crude oil, were the first important applications; supercritical chromatography, impregnation of wood, micronisation and particle formation, production of porous materials including aerogels, special heat transfer applications are examples of more recent applications.

The goal of the conference series has always been to give an overview of the most exciting progress in the field of supercritical fluids of and for Hungarian researchers and professionals from industry. While the original focus of the conference was the application of supercritical fluids in chemical analysis, and chemical and food sectors, this year the scope was wider and included applications related to energy science as well.

In the four sessions 17 lectures were presented, including Katalin Kamarás (Hungarian Academy of Sciences; nanotubes), Gerard Hofland (FeyeCon; drying of herbs), Ulrich Deiters (University of Cologne; phase equilibria) and Edit Székely (BME; hydrothermal liquefaction) as keynote speakers. In the coffee-breaks there was possibility for poster presentations and informal discussions of the nearly hundred participants. We would like to take this opportunity to thank the sponsors of the conference for their contributions (in alphabetic order): ABL&E-JASCO Magyarország Kft., B&T Service Kft., BME Department of Enegry Engineering, BME Faculty of Chemical Technology and Biotechnology, MTA Centre for Energy Research.

Although the topics were diverse, we believe that the extended scope of this conference offered an excellent opportunity to improve exchanges, to bring together the various areas of application, and to favor the transfer of new ideas from apparently distant disciplines.

Another novelty of 2018 is that instead of publishing conference proceedings only, we take this opportunity to publish selected contributions and to invite further papers in this thematic issue of Periodica Polytechnica Chemical Engineering. This thematic issue consists 13 original papers; below we would like to give a brief introduction of the topics in the order they appear in the thematic issue.

When supercritical fluid employing processes are considered high pressure phase equilibrium and thermodynamics play always a key role. The Readers can get useful insights on the most common pitfalls found in some phase equilibrium modelling papers [1], familiarize with anomalous physico-chemical properties of the near critical region [2, 3] having practical importance in the energy engineering. Practical solutions are presented on the application methodology of solubility parameters for cosolvent systems and expanded liquids. [4, 5]

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The expanded liquids play key role in all gas antisolvent processes, which can be used for diastereomeric salt based chiral resolution as well. [6] A special case of diastereomeric salt formation based chiral resolution is described by Lőrincz et al., where novel resolving agents are formed with CO2. [7] Reactivity of carbon dioxide, especially its effect on shifting chemical equilibrium is also critical when its geological sequestration is considered in deep saline aquifers. [8]

Supercritical water has especially high reactivity, being a critical issue when it is applied as coolant in a nuclear power plant [9], furthermore the possibility of unintended phase transitions has to be also carefully considered. [10]

The most well-known applications of supercritical fluids and especially of carbon dioxide are the extractions of plant raw materials. Innovative applications are presented for plane tree bark [11], hawthorn berries [12], and hemp threshing residues. [13]

It is our hope that the Readers will find the papers interesting and useful. The next conference is to be held in Budapest, in 2021; for the announcement please consult later the website sfe.kkft.bme.hu, where the abstract book and contact information of all presenters will be available as well.

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