



EDITOR-IN-CHIEF'S WORD

Micro process engineering is a growing area of the technological process research today, particularly due to the use of experimental systems such as micro structured reactors, or microreactors.

Bruno Zelić, a prominent full member of Croatian Academy of Engineering and Professor at the Faculty of Chemical Engineering and Technology, the University of Zagreb, and his research team have deeply entered the mentioned field by doing laboratory and academic researches. In this issue, as a guest editor, Prof. Bruno Zelić presents some of the significant results achieved in some of his projects.

I believe that you will read this paper with great interest, gaining new insights in this field.

Editor-in-Chief

Vladimir Andročec, President of the Croatian Academy of Engineering



EDITOR'S WORD

Dear readers,

As an academy of engineering sciences, Croatian Academy of Engineering is especially pleased to report on excellent research activities that – beside publications in scientific journals – result in successful collaboration with high-tech oriented industry.

In the same vein, in this issue of Engineering Power we present Guest-Editor Bruno Zelić, Full Member of the Academy and Professor at the Faculty of Chemical Engineering and Technology, and his team.

I am sure you will enjoy reading the presented contributions.

Editor

Zdravko Terze, Vice-President of the Croatian Academy of Engineering



FOREWORD

Microreactors are widely used in different fields of chemical and pharmaceutical industry, biotechnology and medicine. A large surface area to volume ratio, a short diffusion time, a quick and efficient heat and mass transfer are only some of the most important advantages of microreactor systems that have been successfully utilised in the field of chemical synthesis. By using microreactor systems for chemical syntheses, higher conversions and productivity were obtained compared to the reactions carried out in conventional reactor systems. The application of different microreactors for intensification of the chemical and biochemical production processes is intensively studied. According to literature more than 50% of reactions in the fine

chemical or pharmaceutical industry could be intensified by microreactor technology. Although a great majority of the reaction systems that are studied in microreactors are connected with chemical synthesis, biocatalysis and biotransformations in a microreactor are demonstrated as promising alternative. Syntheses, oxidations, transesterifications, polymerizations, hydrolyses and coenzyme regenerations catalysed by enzymes or whole cells are just some of numerous different biotransformations that have been successfully performed in microreactors.

The following papers are part of the scientific research in the field of microreactors and microdevices performed by the members of the Laboratory for Bioseparation Processes at the Faculty of Chemical Engineering and Technology, University of Zagreb and their associates from University of Zagreb and J.J. Strossmayer University of Osijek. Process development, innovations and investigations shown in those papers are mainly supported by Croatian Science Foundation and European Regional Development Fund. The first paper is an extensive overview of microtechnology and microreactors in general. Development of integrated microsystem for production of green note chemical, hexanal is presented in the second paper. The third paper deals with sustainable biodiesel production on micro-scale. All experimental studies performed in microreactors and microdevices are usually supported with mathematical models. Therefore, the fourth paper describes basic principles for mathematical description of hydrodynamics, mass and heat transfer in microreactor systems. Synergy of solid-state fermentation and microreactors is presented in the fifth paper. Finally, the last paper deals with production of microreactor systems by additive manufacturing technology.

Guest-Editor

Bruno Zelić, University of Zagreb, Faculty of Chemical Engineering and Technology