Chemical Papers (2018) 72:1561–1562
https://doi.org/10.1007/s11696-018-0472-0

PREFACE

Polymers for electronics and photonics: science for applications

Jiří Pfleger[1] · **Věra Cimrová**[1]

Published online: 24 May 2018

Over the last two decades, polymers, especially those containing a π-conjugated electron system, have become increasingly important as functional electronic materials. They proved their applicability as conducting and semiconducting materials for many devices such as sensors, transistors, light-emitting diodes, electrical actuators and solar cells. A combination of their electronic and optical properties with good mechanical properties and processability made possible to exploit these polymers in smart windows, in textile with incorporated wearable electronics and labels for smart packaging. Polymers and other organic materials offer a possibility of manufacturing of electronic devices at low cost using low-energy-consuming processes, which brings a major advantage for the production of large area printed electronics. The future progress in this technology requires improvements in the molecular design of new polymer materials and development of new synthetic and processing routes, as well as more detailed understanding of related physical phenomena and the structure-to-properties relationship.

The main advantage of organic materials is a possibility of chemical tailoring for achieving desired electronic and optical functionality by chemical modification of their molecular structure. The final properties of organic electronic devices are, however, influenced also by the supramolecular organization in active layers. It is evident that further progress in this direction depends on available characterization methods which can provide insight into the detailed structure. There is also an increasing importance of theoretical modelling, which can answer fundamental questions regarding charge generation/recombination and transport processes, and helps to improve properties of most organic electronic devices.

✉ Jiří Pfleger
pfleger@imc.cas.cz

[1] Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, 162 06 Prague 6, Czech Republic

Besides the traditional electronic applications, there have been new applications emerging recently in information technology and healthcare utilizing multiscale-guided design, synthesis and multilevel supramolecular assemblies of nanostructured polymers as well as their nanocomposites with metallic nanoparticles, quantum dots and other inorganic crystals. Such composite materials could be used for nanomedicine and biotechnology utilizing multilevel organic/inorganic structures for multimodal bioimaging, sensing and light-activated therapy. An important direction has recently emerged in brain research and neurophotonics for functional mapping and modulation of brain activities based on in situ photon upconversion. Large area conducting polymer electrodes are ideally suited for recording ultraweek bioelectrical activity generated by populations of cells.

This special topical issue of the Chemical Papers contains selected papers presented at the international conference Polymers and Organic Materials for Electronics and Photonics: Science for Applications, which was organized as the 81th Prague Meeting on Macromolecules in September 10–14, 2017. It provided an interdisciplinary forum for scientists working in the field of molecular and polymer materials with emphasis on the electrical, photoelectrical and optical properties and phenomena. The objectives were to promote an international cooperation of researchers both from academia and industry, and to stimulate the research growth in the field of organic electronics and photonics. A special session was dedicated to applications in flexible and wearable electronics and smart packaging. It attracted scientists from the application field of printed electronics and provided a necessary feedback for further development of new materials with desired properties.

This issue continues the tradition of covering this area of research and follows similar recent special issues published in 2013 and 2016, which were, however, more focused on conducting polymers. This collection offers much broader scope including also semiconducting polymers and organic materials applicable in photonics. We hope that the readers will gain an overview on the recent development in synthesis of new functional organic materials and polymers, advanced

characterization methods, new theoretical approaches and on the physical background of phenomena which determine the functionality of organic materials and polymers in electronic devices, as well as on their current application potential.