Microchim Acta (2014) 181:1609–1610
DOI 10.1007/s00604-014-1246-1

EDITORIAL

Preface to the Special Issue on *PCR on chip and related technologies*

Vladimir M. Mirsky · Stefan Rödiger · Peter Schierack · Dirk Roggenbuck

Received: 20 March 2014 / Accepted: 21 March 2014 / Published online: 4 April 2014

The edition of this Special Issue was commenced in 2013 at the occasion of the 60th anniversary of the elucidation of DNA structure. This milestone has completely changed biological and medical sciences and, more recently, has triggered the development of sophisticated instrumentation. The discovery of the polymerase chain reaction (PCR) has further promoted this trend and now allows the analysis of a DNA sequences even at a level of a single molecule. Similarly, various miniaturized chip-based approaches have been introduced in the past 10 years.

The transition from a laboratory scale to a microscale implies many advantages. These include, in particular, reduced sample volumes, reduced costs, shorter assay times, faster heating/cooling rates, higher throughput, and the integration of processing module cascades. The chip approach enabled, in particular, the development of sophisticated PCR assays. These include single-well and multi-well continuous flow PCR devices, stationary chamber-based PCR chips, and planar microbead-based chips. Most of these systems have common components such as miniaturized reaction chambers, heating/cooling units, and an analyzer/detector unit. Some of the devices evolved from the end-point quantification to the multiplex real-time monitoring of amplification reactions and high-resolution analysis of melting curves. These technologies contributed to breakthroughs that were envisioned years before. In particular, PCR in microfluidics and isothermal amplification have radically changed medical diagnostics and life sciences in general.

Any development in field is based on the efforts of experts from highly different fields, examples being molecular biology, surface chemistry, microfluidics, and of course engineering. Systems are becoming smaller and more widely applicable, for example to diagnostics, environmental monitoring, and life sciences. This Special Issue gives a representative selection of the progress made in this field and in technologies related to affinity biosensors in a wider sense.

The Issue includes reviews and original papers. Many of them are based on presentations given at the *7th Senftenberg Innovationsforum on Multiparameter Diagnostics* in April 2013 which was organized by Brandenburg University of Technology Cottbus - Senftenberg (Germany). We have mainly included manuscripts on new analytical techniques, on end-user applications, new instrumentation, sensors and materials, with a main focus on the analysis of nucleic acids. The first part (4 reviews) gives an overview on current technologies such as extraction, amplification and detection of DNA in microfluidic chip-based and microbead-based assays. This includes recent developments in solid-phase enzymatic assays and the application in multiparametric diagnostics. The second part (*Chip-based technologies for amplification, detection and analyses of nucleic acids*) mainly focuses on end-point and real-time PCR techniques. Articles cover topics ranging from fundamental research to commercial applications. Part 3 (*Application of chip-based technologies for amplification, detection and analyses*) covers aspects of reference gene selection, quantification of gene expression, PCR in microfluidics, microarray technology in PCR, conventional and isothermal amplification methods as well as fluorescent detection. The final part (*Chip-based technologies for affinity sensing*) focuses on novel techniques for use in affinity sensing which have a wide application potential including analysis of nucleic acids.

We are confident that this Special Issue represents a timely overview on this field and will fuel novel ideas for microanalytical systems. Last, but not least, we would like to thank the authors of this Special Issue for their excellent articles. We

V. M. Mirsky (✉) · S. Rödiger · P. Schierack · D. Roggenbuck
Brandenburg University of Technology Cottbus – Senftenberg,
01968 Senftenberg, Germany
e-mail: mirsky@b-tu.de

also are grateful to the reviewers for their numerous constructive comments on these manuscripts. We truly hope that readers will enjoy reading the result of this collective effort.

V. M. Mirsky, S. Rödiger, P. Schierack, D. Roggenbuck (Editors)

Brandenburg University of Technology, Cottbus – Senftenberg (Germany)