Microelectronic Engineering 177 (2017) A1

Contents lists available at ScienceDirect

Microelectronic Engineering

journal homepage: www.elsevier.com/locate/mee

Preface

Editorial - Special issue on micro- and nano-patterning

For decades the patterning of nanostructures has been the key to novel nanodevices. Standard processes have been extended from the well-established photolithography towards UV-photolithography, electron beam lithography and ion beam lithography. The use of new nanomaterials and new applications in biomedicine, photonics and nanomechanics has become a challenge for nanopatterning. The success of microelectronics and nanoelectronics relies on ongoing advances in patterning.

This special issue focuses on the most current developments in micro- and nano-patterning. The importance of this field is based on the capability to transform functional materials into device-relevant geometries. Advances in this fields are outlined through the 17 publications compiled here. These contributions are loosely related to presentations at the Micro- and Nano-Engineering 2016 conference, which was held in Vienna, Austria. At this conference with around 700 participants from science and engineering recent progress and future trends in the fabrication and application of micro- and nanostructures and devices as well as applications in electronics, photonics, electromechanics, environment, life sciences and biology have been discussed. MNE shows how electronic systems will continue to shape the future and micro- and nano-patterning is at the heart of this development which covers a broad range from micro- and nano-electronics, embedded, to cyber-physical as well as integrated systems and bioelectronics.

The individual articles cover a wide range of different flavors of lithographic processes as well as potential applications in future generations of electronic, photonic or MEMS devices or sensing platforms. The variety of topics represents the wide range of applications of micro- and nanostructuring approaches in current research. This also emphasizes the relevance of micro- and nano-patterning technology as a key enabling factor for future developments. In the following, we would like to highlight the most prominent subjects, which currently represent fields of intensive research.

Several approaches are trying to push lithographic techniques to their limits to achieve smaller and smaller geometries, which will enable highly integrated electronic, photonic, mechanical or hybrid systems. The major focus of several articles lies in the ongoing development of extreme ultra-violet lithography. Particular topics to be highlighted are the optimization of gray-scale lithography at 50 nm scales {Fallica et al. MEE 177, 1-5 (2017)} or a lithographic process on flexible substrates, which allows to exceed the minimum period for UV-based holography {Bichotte et al. MEE 177, 66-69 (2017)}.

A second group of articles deals with mask-less lithography techniques, which enable flexible prototyping and fast iteration cycles. This includes works on tip coatings or exposure studies of thin polymer films for scanning probe-based processes or focused ion beam implantation of catalyst material for subsequent site-selective nanowire growth. Scanning probe lithography is demonstrated as a multi-functional tool for polymer-based structures {Krivoshapkina et al. MEE 177, 78-86 (2017)}.

Furthermore, some articles put emphasis on the influence of patterning processes or external effects like mechanical deformation on the characteristics of device prototypes, which are based on novel or unconventional materials, including indium-tin-oxide (ITO), $PbZr_{1-x}Ti_xO_3$ (PZT) or parylene C. As an example, ion bombardment as it is occurring during plasma processes is shown to alter the permittivity and reliability of PZT {Wang et al. MEE 177, 13-18 (2017)}.

In summary, this issue shines a representative spotlight on the current research activities in micro- and nano-patterning. The variety of the presented topics indicates, that the field of micro- and nano-patterning will remain a pace maker for the development of new devices and the use of new nanomaterials. The publications of this issue pave the way for future research in this field and it is already clear now that micro- and nano-patterning will remain a key enabling technology of nanotechnology in future.

Finally, the editors would like to thank all authors and research groups for their efforts. The editors highly acknowledge the efforts invested by the reviewers, who had a strong impact on honing the scientific message for the reader. Authors and reviewers have in combination enabled the publication of this special issue.

Hermann Detz [a, b, *]
Heinz D. Wanzenboeck [c]
[a] *Austrian Academy of Sciences, Austria*
[b] *Center for Micro- and Nanostructures, TU Wien, Floragasse 7, Wien 1040, Austria*
[c] *Institute for Solid-State Electronics, TU Wien, Floragasse 7, Wien 1040, Austria*
[*] Corresponding author at: Austrian Academy of Sciences, Austria.
E-mail addresses: hermann.detz@tuwien.ac.at (H. Detz), heinz.wanzenboeck@tuwien.ac.at (H.D. Wanzenboeck)

http://dx.doi.org/10.1016/j.mee.2017.04.029
0167-9317/