

Editorial

Special Issue on “Micro/Nano Manufacturing”

André Zimmermann ^{1,2}  and Stefan Dimov ^{3,*}

¹ University of Stuttgart, Institute for Micro Integration (IFM), Allmandring 9 b, 70569 Stuttgart, Germany; zimmermann@ifm.uni-stuttgart.de

² Hahn-Schickard, Allmandring 9 b, 70569 Stuttgart, Germany

³ Department of Mechanical Engineering, School of Engineering, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK

* Correspondence: S.S.Dimov@bham.ac.uk

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1. Introduction

Micro manufacturing is dealing with the fabrication of structures in the order of 0.1 to 1000 μm . The scope of nano manufacturing extends the size range of manufactured features to even smaller length scales: below 100 nm. A strict borderline between micro and nano manufacturing can hardly be drawn, such that both domains are treated as complementary and mutually beneficial within a closely interconnected scientific community. Both micro and nano manufacturing can be considered as important enablers for high-end products. Especially, such products are enabled by micro and nano features and structures to incorporate special optical, electronic, mechanical, fluidic or biological functions into existing and new emerging products, and thus lead to unique selling points. Application fields include, but are not restricted to, precision instrumentation, sensors, metrology, energy harvesting, mechatronic systems, transport, medical technologies and life sciences. This Special Issue is dedicated to recent advances in research and development within the field of micro and nano manufacturing. The included papers report recent findings and advances in manufacturing technologies for producing products with micro and nano scale features and structures as well as applications underpinned by the advances in these technologies. In particular, the Special Issue covers the following topics:

- Micro fabrication technologies, process chains and process characterization;
- Novel product designs, micro-assembly technologies and micro-handling;
- Surface engineering and interface nanotechnology;
- Process modeling and simulation;
- Processing and characterization of nanomaterials;
- Micro and nano additive manufacturing technologies;
- Micro and desktop factory concepts, systems, components and modules;
- On-line monitoring and inspection systems/methods;
- Applications of micro and nano technologies.

2. History of the World Congress on Micro and Nano Manufacturing

This Special Issue is predominantly based on selected papers presented at the World Congress on Micro and Nano Manufacturing (WCMNM 2018) held in September 2018 in Portoroz, Slovenia [1], which was organized jointly by 4M [2], I2M2 [3] and the International Forum on Micro Manufacturing (IFMM) [4]. Further contributions were collected via a call for papers used by the Applied Sciences

journal. Although the gathering of the global scientific community in micro and nano manufacturing in Portoroz was merely the second edition within the WCMNM series after WCMNM 2017 in Kaohsiung, Taiwan, the tradition of international conferences on micro manufacturing dates back to the year 2005. In this year, 4M organized the First International Conference on Multi-Material Micro Manufacture held in Karlsruhe, Germany [5]. Only one year later, I2M2 initiated its series of International Conferences on Micro Manufacturing (ICOMM) with a first meeting at Urbana-Champaign, USA, in 2006. Additionally, the first IFMM took place in Gifu, Japan, in 2010. These coinciding activities and joint efforts in America, Asia and Europe laid the foundation for WCMNM as a world-wide platform dedicated to micro and nano manufacturing.

3. Content of the Special Issue

The Special Issue contains 13 papers covering the topics listed above [6–18]. The treated micro fabrication technologies range from established processes like elliptical vibration cutting to novel process chains such as the formation of nanoparticle arrays by hot embossing and sputtering. Even for well-known processes, modeling can contribute to their better understanding, and thus, lead to improved process control and quality of produced products. Therefore, it is not surprising that a number of contributions in this Special Issue report modeling results, which can enhance the knowledge and in depth understanding of processes underpinning micro and nano manufacturing solutions and their respective applications. Since additive manufacturing is currently attracting a significant interest from industry and research in general, it is again not surprising that additive manufacturing contributions also feature prominently in in this issue. For example, advances in selective laser melting are reported together with investigations into achievable surface quality of additively manufactured microstructures, which represents a major challenge for the broader use of this technology for micro manufacturing. Last but not the least, this Special Issue reports numerous applications of micro and nano manufacturing technologies with a special focus on micro-optics and micro-fluidics.

The Special Issue is the culmination of the efforts and dedication of many people to make it reality. We would like to thank the WCMNM 2018 sessions' chairs for selecting conference contributions that defined the skeleton of this Special Issue. Furthermore, the work of the reviewers involved in preparing this Special Issue needs to be acknowledged.

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