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Original published in: Nanomanufacturing and metrology. - [Singapore] : Springer Singapore. - 4 (2021), 3, p. 131.

Original published: 2021-09-07

ISSN: 2520-8128

DOI: 10.1007/s41871-021-00113-7

[*Visited:* 2022-03-03]

Nanomanufacturing and Metrology (2021) 4:131
https://doi.org/10.1007/s41871-021-00113-7

FOREWORD

Foreword to the Special Issue on "Tip- and Laser-Based 3D Nanofabrication in Extended Macroscopic Working Areas"

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Accepted: 23 July 2021 / Published online: 7 September 2021

The semiconductor industry has been following Moore's law with astonishing continuation for 55 years now. Manufacturing is advancing from precision manufacturing, micromanufacturing, and nanomanufacturing toward atomic and close-to-atomic scale manufacturing (ACSM), which is the core competence in Manufacturing III. In addition to the continuous refinement of optical lithography, an increasing number of alternative nanofabrication technologies are being considered. The research training group "Tip- and Laser-Based 3D Nanofabrication in Extended Macroscopic Working Areas" is set to elaborate upon the scientific and technical foundations for the systematic and consistent application of precision engineering and precision measurement strategies and approaches to nanofabrication processes. Methodologically, this involves the synergetic merging of powerful AFM tip- and laser-based nanofabrication technologies with high precision, cross-scale 3D nanopositioning, and nanometrology (AFM stands here for "atomic force microscope"). For many years, TU Ilmenau has been acknowledged worldwide for its unique position in the fields of fiber optic-coupled laser interferometry, nanopositioning, and nanomeasuring machines, as well as single-digit lithography; therefore, it is predestined for this research focus. The research work is organized in the project areas of tip- and laser-based nanofabrication and nanofabrication on free-form surfaces, incorporating the cross-cutting topics of theory and metrology, tools and parallelization, and kinematics and control.

With this Special Issue, representative samples of the research work and the latest scientific results are provided to the scientific community. An overview of the article presents the entire breadth of the research training group. In particular, new accents are set by the new 100-mm nanofabrication platform in combination with the further development of single-nanodigit lithography. The following articles cover various scientific topics, particularly the combination of laser-based, two-photon polymerization and nanoimprint technology on curved surfaces using a novel five-axis nanopositioning and nanomeasuring machine. Other contributions are devoted to new approaches for optical lithography, further development of interferometric techniques for position measurement and control in nanopositioning, and nanomeasuring machines, and the development of high-precision tool-changing systems for nanofabrication.

The guest editors would like to thank the contributing authors for all their effort in presenting their excellent research work for the Special Issue. Appreciation also goes to the German Research Foundation for funding the Research Training Group GRK 2182 "Tip- and Laser-Based 3D Nanofabrication in Extended Macroscopic Working Areas" at Technische Universität Ilmenau.

The guest editors would also like to thank the Editor-in-Chief, Professor Fengzhou Fang of Tianjin University, China, and the executive editor, Professor Wei Gao of Tohoku University, Japan, for their tremendous support in the preparation of this Special Issue. The kind support from the editorial office of Nanomanufacturing and Metrology is also appreciated.

Funding Open Access funding enabled and organized by Projekt DEAL.

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