



KONINKLIJKE
HOLLANDSCHE MAATSCHAPPIJ
DER WETENSCHAPPEN

Juryrapport

KHMW Jong Talent Afstudeerprijs voor Werktuigbouwkunde en Materiaalkunde 2023

Thomas Michalica MSc, Delft University of Technology

Two-photon polymerization-based 3D-multi-electrode arrays for electrical monitoring of neuronal cells

Nine master theses were submitted this year for the KHMW Young Talent Award for Mechanical Engineering and Materials Science. The jury was very pleased with the high level of the submitted theses, representing the field in its full width: from solid mechanics to fluid dynamics, from thermodynamics to design, construction and control, covering applications from atomic levels to large infrastructures. They reflect the impressive quality of the mechanical and materials science education and research at our Dutch universities. The selection of a winner was not a simple task due to the excellent quality of the nominated candidates. After careful considerations, the jury unanimously decided to award the 2023 Prize to Thomas Michalica, a graduate of the Faculty of Mechanical, Maritime and Materials Engineering at Delft University of Technology, within the chair of Micro- and Nano-Engineering.

Thomas Michalica completed his BSc at the Technical University of Vienna in Austria. He started this MSc at Delft University of Technology in 2020, under full COVID restrictions, and completed it successfully with a “cum laude” distinction. His MSc thesis was a collaboration between the Faculty of Mechanical, Maritime and Materials Engineering and the Faculty of Electrical Engineering. His interdisciplinary master project was entitled “Two-photon polymerization-based 3D-multi-electrode arrays for electrical monitoring of neuronal cells”. For the first time in literature, Thomas realized, by combining cleanroom microfabrication processes and 3D high-resolution additive manufacturing, hybrid metal/polymer 3D multi-electrode arrays for electrical monitoring of neuronal cells. These devices can be employed in the near future to study neurodegenerative diseases such as Alzheimer’s and Parkinson’s. His results showed how polymers, with mechanical properties closer to brain tissue compared to conventional Silicon, can be shaped and intertwined with metallic patterns to obtain a first-of-its-kind hybrid 3D multi-electrode array. Thomas effectively proposed design solutions and defined manufacturing processes, precisely reporting the outcomes of his experiments, whereby he proposed backup solutions to overcome shortcomings. His final report clearly reflected the background, challenges, design, processing, analysis, conclusions and self-reflections. To carry out this work, he had to work across three different laboratory environments where he effectively engaged with the respective technical teams to synchronize the research activities. His results were also presented orally by Thomas at the Brain-on-chip symposium in 2022 in Delft and are expected to make further impact on science and society.

Taking all considerations into account, the jury concluded that Thomas Michalica is the deserved winner of KHMW Young Talent Award for Mechanical Engineering and Materials Science 2023.



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Prof. dr. ir. M.G.D. (Marc) Geers, hoogleraar mechanics of materials Technische Universiteit Eindhoven

Prof. dr. T.T.M. (Thom) Palstra, hoogleraar vaste stof chemie Universiteit Twente, rector emeritus Universiteit Twente

De jury vergaderde op 1 november 2023 via Zoom onder leiding van KHMW-maatschappelijk lid Dr. W. (Wim) Bijleveld. Tevens was ter vergadering aanwezig Prof. dr. A.P. (Ad) IJzerman, bestuurslid en secretaris natuur- en medische wetenschappen KHMW.