

Supervisor's opinion on the PhD. thesis

“Preparation of Conductive and Semiconductive Patterns by Digital Printing of Nanodispersions for Sensing Devices of Organic Compound Vapours”

by

Jan Mašlík

submitted to the

Tomas Bata University in Zlin

Ing. Jan Maslik studied in the Study course ‘Technology of Macromolecular Compounds’ in the Ph.D. programme ‘Chemistry and materials technology’ at the Centre of Polymer Systems, Tomas Bata University in Zlín, Czech Republic. Within his studies, he has fulfilled all duties connected with the study programme and successfully passed the state exam in 2018. His dissertation work was focused on preparation of sensor devices for sensing of vapours of volatile organic compounds based on semiconductive metal oxides. His specific aim was to study materials and find suitable design of such devices so that they can be operated at room temperature unlike standard MOx devices. In order to accomplish this ambitious task, he developed step by step the technique of material printing. Firstly, he had to optimize printing of conductive patterns for creation of circuits and electrodes intended for further integration into the sensor device architecture. Then he prepared successfully sensors based on ITO and studied their sensor function at room temperature. He applied a renewed approach to the optimization of ink and printing process development using dimensionless criteria. He gathered valuable lessons from this second stage of his work and used the knowledge in the last step of his work for preparation of a room temperature operated sensor based on ZnO nanowire forest-like structure. The main contribution is his idea to use cold UV activation of the ZnO layer instead of the high temperature. Direct preparation of the sensing layer on top of a quartz glass window of a UV LED is another of his inventions. He prepared several demonstration specimens and successfully tested the proof of concept. Hence the application potential of these newly developed materials and device design approaches is evident.

Honza was a useful member of our group. The importance of his work is best manifested within the framework of our team research activities since it was a necessary prerequisite for further development in this field. Another testimony on his research qualities is his current job at the University in Uppsala where he joined a team working on development of flexible and stretchable electronics fabricated by material printing.

The abilities and readiness of Jan Mašlík to start an independent career of a researcher are documented by the list of his publications and presentations on international conferences with full-text contributions in proceedings too. He has experience from a number of project he took part on. During his study and work at the TBU in Zlín, Ing. Jan Mašlík has already demonstrated sufficient diligence, knowledge and effort necessary for successful accomplishment of doctoral study in the PhD. Programme.

With regard to these facts and according to my opinion, I recommend the Thesis to be defended and upon his presentation and successful defence and all further necessary considerations by the committee to award Mr. Mašlík the degree Doctor of Philosophy (Ph.D.).

Zlín 16th April 2019

A handwritten signature in black ink, appearing to read 'Ivo Kuřitka', with a long horizontal flourish extending to the right.

Assoc. Prof. Ing. et Ing. Ivo Kuřitka, Ph.D. et Ph.D.

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