

Supervisor's opinion on the PhD. thesis
“Preparation and characterisation of nanocomposite thin films applicable in organic electronics”

by

Jakub Ševčík

submitted to the

Tomas Bata University in Zlín

Ing. Jakub Ševčík 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 2019. His dissertation work was focused on the preparation of polymer light-emitting diodes from nanocomposites based on MEH-PPV polymer matrix and nanofillers based on semiconductive metal oxides. His specific aim was to study effects of addition of undoped and doped ZnO nanoparticles and find suitable design of such devices so that they can reach high luminance. To accomplish this ambitious task, he developed step by step the technique of PLEDs preparation in our laboratory with particular attention paid to the robustness and simplicity of used methods. Firstly, he had to optimise the preparation of standard MEH-PPV diodes to obtain a reference device. Then he prepared PLEDs successfully from nanocomposites with commercially available nanoparticles. Based on this first experience, he used nanoparticles tailored in our group to find optimum size of the nano ZnO filler. Addition of these particles had already a strongly manifested positive effect on the luminance of prepared devices. Doped particles with tailored band-gap were investigated in the next step of the research. Both positive and negative doping by iron and aluminium, respectively, was examined. Significant lowering of the opening voltage as well the increase of luminance of prepared devices was observed and analysed. Hence the application potential of these newly developed materials and device design approaches is evident. Moreover, we've got a clue on how to continue to maximize the efficiency and performance of these devices in future.

Jakub is a useful member of our group. The importance of his work is best visible within the framework of our team research activities aiming at multifunctional nanocomposites, where the cooperation between people of various backgrounds and expertise is crucial. The abilities and readiness of Jakub Ševčík 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 many research projects. During his study and work at the TBU in Zlín, Ing. Jakub Ševčík has already demonstrated sufficient diligence, knowledge and effort necessary for successful accomplishment of doctoral study in the PhD. Programme.

Concerning these facts and according to my opinion, I recommend the Thesis for defence and upon successful presentation of his dissertation, and all further necessary considerations by the committee, to award Mr Ševčík the degree Doctor of Philosophy (Ph.D.).

Zlín 17th October 2019

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

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