

EVALUATION REPORT

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Regarding to: PhD thesis of **Georgi Tsvetanov Marinov** on the topic: "*Fabrication of thin films of ZnO doped with Al, Co and Ni by electro-spraying method: properties and application*" to obtain an educational and scientific degree "doctor" in professional field 4.1. "Physical Sciences", Scientific Specialty: Electrical, magnetic, and optical properties of condensed matter

Georgi Marinov obtained a master's degree in the specialty "Engineering Physics - Microelectronics and Information Technologies" at the Faculty of Physics of the University of St. Kliment Ohridski in 2014. In the period 2017-2022, he is a part-time doctoral student in the professional field of "Physical Sciences", scientific specialty "Electrical, magnetic, and optical properties of condensed matter" at the Institute of Optical Materials and Technologies "Acad. J. Malinovski". He is currently employed at the institute as a "physicist". From 2013 until now, he has worked for numerous companies, and his main activity is related to the development and production of various devices and materials.

The presented thesis was prepared in accordance with the requirements of the regulations for the terms and conditions for acquiring scientific degrees and for occupying academic positions at IOMT-BAS. It is written extremely competently, and the material is well structured and laid out, which allows it to be easily read and understood. The thesis has a volume of 135 pages and consists of an introduction and topicality of the subject, purpose and tasks, five sections, conclusion, and scientific contributions. 166 literary sources are cited. The thesis is based on five scientific publications published in refereed journals with an impact factor, four of which have been cited a total of 25 times.

The thesis is devoted to the development and improvement of a new apparatus for electrostatic spraying with improved functionality. A method was developed to evaluate the spraying process, by which the optimal parameters for obtaining fine, stable, and uniform spraying were determined. The influence of the main process parameters during electro-spray on the structure, morphology, and optical characteristics of deposited ZnO thin films has been examined and studied in detail. The possibility of application of the as-deposited samples (pure and doped) in the fields of photocatalytic oxidation of nitrogen oxides, as well as detection of ammonia vapors, was investigated. The aims and tasks are clearly formulated. The thesis shows that the PhD student has in-depth knowledge in the field of engineering sciences and materials science. It contains scientific and scientific-applied results representing an original contribution. I would attribute the nature of scientific contributions to the *creation*

of new classifications, methods, constructions, technologies; enrichment of existing knowledge and theories, as well as application of scientific achievements in practice.

The conversations with the PhD student on the essence and presented results in the thesis, as well as the presentation of the material before the IOMT Colloquium, leave a good impression of his personal contribution.

I have no critical remarks about the materials presented. Single terminological inaccuracies are observed, which generally do not interfere with the understanding of the material. The abstract has been prepared according to the requirements, and its content corresponds to the content of the thesis, adequately reflecting the main results obtained.

Questions:

- Can the direct formation of nanoparticles be achieved by electro-spaying, changing the main process parameters?
- The content of the doped elements is set as a percentage of the corresponding precursor relative to the zinc oxide precursor. What is the content of doped elements in the deposited ZnO films?
- What will be achieved by constructing a system for focusing the electrospraying beam?

Conclusion: The thesis of **Georgi Marinov** was developed at a high scientific level and meets the requirements according to the Law on the Development of the Academic Staff and the rules for its application, as well as the rules of the IOMT for the application of the ADAS RB. The attached report of passed exams and taken credits shows that the PhD student significantly exceeds the required minimum according to the regulations for the activity of the Training center at the BAS. The results have been published in reputable and referenced journals with an impact factor and citations of the works have been noticed. Based on the above, I fully support and strongly recommend that the Scientific Jury award the educational and scientific degree "Doctor" to Georgi Marinov in professional direction 4.1 Physical Sciences, scientific specialty "Electrical, Magnetic, and Optical Properties of Condensed Matter".

14/06/2024

Sofia

Prepared the Evaluation Report: ...

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/A. Dikovska/