

Supervisor's opinion on the PhD. thesis
“Hybrid nanomaterials for photoanodes in photoelectrochemical water splitting”
written by
Ali Can Güler
submitted to the
Tomas Bata University in Zlín

Ali Can Güler studied Ph.D. programme 'Nanotechnology and Advanced Materials' at Tomas Bata University in Zlín, Czech Republic. During his studies, he fulfilled all duties connected with the study programme and successfully passed the state doctoral exam in 2023. His dissertation work is focused on the preparation and characterization of new materials for photoanodes in photoelectrochemical water splitting, particularly ZnO, sensitised with BiVO₄ and Au nanoparticles. A significant scientific contribution is the exploration of how modifications to thin metal oxide films, such as morphological parameters, hierarchical structure, gradient doping, and heterostructure formation, impact light absorption and charge separation. These objectives were successfully fulfilled in three published works. First, a comprehensive study on the ZnO nanorod morphological dependence of PEC water splitting was performed. Second, the ZnO nanostructured photoanode surface was decorated by Au nanoparticles, and a gradient doping structure was prepared. Third, the electrodeposition of Bi metal followed by its oxidation and reaction with vanadate source to produce BiVO₄ on the surface of ZnO nanostructure was used to obtain type II heterojunction materials. The structural modifications yielded enhanced photocurrent and efficiency extended to the visible range of the solar spectrum.

Ali Can Güler is an author or co-author of seven journal publications already indexed on WoS; the eighth publication has been submitted. He also actively presented his results at two international conferences and co-authored another two conference contributions.

Ali Can also spent one month at the FunGlass Centre in Slovakia under the supervision of Assoc. Prof. Velázquez in 2022 and four months at the Institute of Electrochemistry at Ulm University under the supervision of Prof. Beránek in 2023.

As mentioned above, the dissertation thesis is based on two published and one submitted original full-length articles in the following journals: *Nanoscale Advances*, *International Journal of Molecular Science* and *Journal of Materials Science*. All these journals are relevant to the field of study and are impacted and indexed by Thomson Reuters ISI Web of Science. Ali Can Güler is the first author of all the papers, and his contribution to these publications was the most significant. Therefore, the body of the Thesis consists of parts potentially indicated by similarity analysis in anti-plagiarism text-checking systems. It must be emphasized that all these scores account for the three papers with Ali Can's works and results. All these paragraphs are appropriately cited. The three papers are auto-referred by [ACG X] codes, where X stands for the main paper number 1, 2 or 3, to simplify the reading of the Thesis. Moreover, the study regulation requires that substantial parts of the Thesis be published, making matching the Thesis with the published works inevitable.

To summarize, during his study at the TBU in Zlín, Ali Can Güler has demonstrated sufficient diligence, knowledge and effort necessary for the successful fulfilment of the studied PhD. programme. With regard to these facts and according to my opinion, the submitted dissertation work is well conceived, and I recommend it to be defended and, upon successful defence, Ali Can Güler will be awarded the Doctor of Philosophy (Ph.D.) degree.

Zlín 20th December 2023

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