

## **Supervisor Report on PhD Thesis**

Faculty: **Central European Institute of Technology**  
Student: **Michaela Remešová**

Academic year: **2019/20**

Doctoral study program: **Advanced Materials and Nanosciences**  
Field of study: **Advanced nanotechnologies and microtechnologies**  
Supervisor: **prof. Ing. Jozef Kaiser, Ph.D.**

**PhD thesis title:** Research and development of a technology of hard anodization of nonferrous alloys

### **Evaluation of doctoral thesis:**

Ing. Michaela Remešová has been a member of our research group since her bachelor studies in 2013. After finishing her master thesis, she has been, as a PhD student, intensively working on her topic and involved in five related interdisciplinary research projects.

Michaela's dissertation thesis deals with the topical research on progressive surface treatments, in which case the principles of electrochemistry are used to produce protective and functional coatings that are formed directly by conversion of the outer layer of substrate material into the oxide protective layer. Such treatments are suitable for many different industrial applications, more specifically, the studied coatings are valued for high hardness, wear, and oxidation resistance, which is important for instance for parts operated in contact, and for dry vacuum pumps applications.

Therefore, the aluminium (AA1050), magnesium (99.9% Mg) and zinc (ZnTi2) lightweight non-ferrous alloys were selected for detailed investigation in the thesis. The formation of the oxide/ hydroxide layer, its properties, especially thickness, hardness and wear resistance, and their interaction with technological parameters, such as the surface roughness, type of electrolyte, voltage, current, and temperature were thoroughly described and discussed, successfully concluding the PhD topic research. Furthermore, it should be also noted that Michaela designed and constructed the apparatus for galvanic and anodic protective layers formation during her study.

Michaela successfully learned the problematics of formation of conversion coatings on non-ferrous alloys, design and construction of apparatuses, general engineering manufacturing methods, methods of structural and phase analyses of materials, and hardness and wear testing of materials. She solved the thesis topic independently and on her own. Moreover, she successfully completed a three months research stay abroad, at the TU Graz in Austria, in the research group of prof. Bernhard Gollas, who is an excellent European researcher in the field of electrochemistry, under his direct supervision. She acceded to the topic and all the laboratory work in excellent and responsible manner. The written thesis is well ordered, systematic and clear for the scientific audience working in the field of electrochemistry and surface treatments. I am also noting a high formal and stylistic level of the work, except for some minor typos.

The results of the doctoral thesis and Michela's other work on interdisciplinary projects in which she was involved were published in seven highly reputable impact journals (*Applied Surface Science*, *Surface and Coatings Technology*, *Journal of the American Society*, *Journal of the European Ceramic Society*, *Metallurgical and Materials Transaction B*, *Engineering Failure Analysis*, and *Spectrochimica Acta B*), presented at nine international conferences, and published in eleven conference proceedings (most of them listed in WoS and/or Scopus).

Overall, I found Michaela a very valuable member of the research team, an independent hard working and critically thinking person who was always ready to help solving current scientific issues. **I am delighted to recommend her thesis for the defence** leading to the PhD degree.

In Brno, 4<sup>th</sup> September, 2020

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prof. Ing. Jozef Kaiser, Ph.D.

Supervisor of doctoral thesis