

Faculty of Mechanical Engineering
Brno University of Technology

Principal supervisor's final report on the PhD study

1. PhD candidate
Jan Suchý / E-mail: jan.suchy1@vut.cz
2. Name of PhD programme
Design and Process Engineering
3. Title of PhD thesis
Processing of Magnesium Alloys by Selective Laser Melting Method

4. Principal supervisor
doc. Ing. David Paloušek, Ph.D. / E-mail: david.palousek@vut.cz
5. Co-supervisor
doc. Ing. Daniel Koutný, Ph.D. / E-mail: Daniel.koutny@vut.cz doc. Ing. Libor Pantělejev, Ph.D. / E-mail: pantelejev@vutbr.cz

6. Stays at other institutions (min. 7 days)
Institution / Country / From / To

7. Teaching activities
Course name / Total number of hours
Engineering Drawing Fundamentals (1K)/52
Machine Design (2K)/26
CAD – Basic (3CD)/208
Design and CAD (4KC/CKC)/104
Digital Technologies and CAD (RS1)/12
CAD Modelling (ZM1)/88
Additive Technology (ZAT)/26

8. List of main publications
IF journals
1. Suchy J, Horynová M, Klakurková L, Palousek D, Koutny D, Celko L. Effect of laser parameters on processing of biodegradable magnesium alloy WE43 via selective laser melting method. <i>Materials (Basel)</i> . 2020;13(11). - <i>Materials, MPDI – IF 3.623, Q2</i>
2. Suchy J, Pantelejev L, Palousek D, Koutny D, Kaiser J. Processing of AlSi9Cu3 alloy by selective laser melting. <i>Powder Metall.</i> 2020;63(3):197–211. - <i>Powder Metallurgy, Taylor & Francis – IF 1.911, Q2</i>



3. Suchý J, Klakurková L, Man O, Remešová M, Horynová M, Vojtěch D, et al. Corrosion behaviour of WE43 magnesium alloy printed using selective laser melting in simulation body fluid solution. 2021;69(June):556–66. - *Journal of Manufacturing Processes, Elsevier – IF 5.01, Q2*

WoS or Scopus

1. Skřivánková, V.; Vlašic, F.; Suchý, J.; Paloušek, D.; Mazal, P. Study of fatigue loading of the SLM and cast material by acoustic emission method. In *Metal 2018 - 27th International Conference on Metallurgy and Materials, Conference Proceedings*. Ostrava-Zabreh: Tanger LTD., 2018. s. 1345-1350. ISBN: 9788087294840.
2. Křištofová P, Roudnická M, Kubásek J, Paloušek D, Suchý J, Vojtěch D. Influence of Production Parameters on the Properties of 3D Printed Magnesium Alloy Mg-4Y-3RE-Zr (WE43). *Manuf Technol*. 2019 Oct 24;19:613–8. 98
3. Křištofová P, Kubásek J, Vojtěch D, Paloušek D, Suchý J. Microstructure of the Mg-4Y-3RE-Zr (WE43) magnesium alloy produced by 3D Printing. *Manuf Technol* [Internet]. 2019;19(1):89–94.
4. Křištofová P, Roudnická M, Kubásek J, Michalcová A, Vojtěch D, Suchý J, et al. Magnesium alloy we43 produced by 3d printing (Slm). *Defect Diffus Forum*. 2020;405 DDF:345–50.
5. Křištofová P, Kubásek J, Roudnická M, Michalcová A, Suchý J, Paloušek D, et al. Structure and properties of additively manufactured WE43 magnesium alloy. In: 28th International conference on Metallurgy and Materials. Brno; 2019. p. 1578–82.

9. Assessment of the supervision process

Very good

The topic of PhD studies is focused on additive manufacturing from magnesium alloys and freely follows previous Jan's diploma thesis. Jan approached the issue systematically according to the study plan with the support of the national project MPO TRIO. Thanks to the project, Jan established cooperation with a company and university research group. The research activities were conducted to apply the knowledge to a specific product and industrial usage. He had to adapt the manufacturing technology and improve safety to do the experiments because of the high reactivity of the material. During the study, Jan published three scientific IF articles as the main author and five papers as co-author. He had to adapt the manufacturing technology and improve safety to do the experiments.

10. Assessment of the candidate's ability to work independently

Very good

Jan worked on the topic independently. If possible, he followed the schedule and consulted regularly. He carried out laboratory measurements and prepared experiments. The area of magnesium alloys was supported by two projects: INTERREG AT-CZ ReMaP, ATCZ229 (partners LKR Leichtmetallkompetenzzentrum Ranshofen GmbH and FH OÖ Forschungs & Entwicklungs GmbH) and national project MPO TRIO (FV20232) Structural biodegradable implants processing by means of direct metal laser sintering (Prospan, The University of Chemistry and Technology, Prague). Projects provided a good background for the work, and Jan brought the opportunity to cooperate with other colleagues in the field. He was the main author of three impact articles.

11. Assessment of the contribution that the research makes to knowledge in the field

Good

Jan described the problems associated with the additive manufacturing process of magnesium alloy using laser additive technology. His research revealed some phenomena that fundamentally affect the quality of



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the laser melted material. Laser melted magnesium alloys represent a relatively rare topic, unlike, for example, aluminium alloys. Revealing the causes of instability in the process is a basic prerequisite for applicability. An essential part of the work is the assessment of the suitability of the use of AM processed material for medical procedures. Jan dealt with the influence of surface roughness on the corrosion behaviour and corrosion rate. It is possible to estimate how the corrosion rate of the processed material changes with the laser power and scanning speed. This knowledge is essential for real applications in biomedicine.

12. Other comments

Jan was also active in supervising the bachelor these. He cooperated on several commercial projects, for example, for Thermofischer, Honeywell, Hanon Systems, and CEITEC Research Institute.

13. Conclusion

PhD thesis is an independent scientific work that presents a novel solution to a significant problem in the research area and demonstrates the candidate's ability to conduct independent research.

YES

14. Date and signature

18/02/2022

Please note

- Evaluate categories 9 to 11 using the following scale: unacceptable, acceptable, satisfactory, good, very good, excellent.
- In each category 9 to 11 explain reasons for evaluation using between 100–200 words.
- E-mail the completed form to: Klara.Javorcekkova@vut.cz