A.2 Abstract

In this summary some research activities and the results of the period following the public defense of the doctoral thesis "Vitrification of bottom ash from incineration of Municipal Solid Waste and their reuse for the preparation of new materials", from 4/03 / 2006 will be briefly presented.

This Habilitation Thesis is **structured in two parts**, as follows:

1. the first part, presents the summary of the thesis, both in Romanian and in English;
2. the second part: covers (i) scientific research and academic achievements, (ii) future development plans and (iii) bibliographic references.

In the first part, the analysis and the results of the obtained scientific activity are presented, structured in nine main fields of research, from materials engineering and study to ensure the appropriate quality of these materials and to have the main basis for the development of high quality parts. In this context, the personal contributions obtained in approaching these scientific research activities are also highlighted. The research directions presented aim to express different aspects of my experimental research and which are also part of the class of Al alloys, paying special attention to obtaining materials of optimal quality in order to be used later, according to its quality, in some engineering application. The development and optimization of Al alloys, their characterization in terms of structural, microstructural, mechanical strength, being the most important, through various test methods used in the laboratory, are the basis for obtaining high quality engineering parts.

In the second part, the analysis and results of the scientific activity obtained are presented, structured on two main research areas and which includes Ti alloys, focusing my attention, in the first part, on the possibilities of replacing a traditional production process with a new one, while in the second part on the development of an alloy with a new composition showing the appropriate qualities for application in the biomedical field.

Current needs call for innovative solutions, which can be achieved by combining the possibilities offered by certain features of innovative materials associated with new engineering processes and techniques.

During the thesis, the importance of using high quality materials with high properties for the development of certain parts in different industrial fields and/or biomedical applications is emphasized, areas where there is a demand for superior characteristics.

In many scenarios, the research has an interdisciplinary character highlighting the personal interest in the study, the optimization of processes and materials streamlining current solutions in order to obtain high quality materials.

The second part of this habilitation thesis includes the description of some significant facts and important achievements in my scientific and academic career. On the one hand, the technical description of some scientific contributions obtained in two research directions approached during the interested time frame will be presented, and the scientific papers, which are the basis for the elaboration of the habilitation thesis are the following:

1. I.Peter, M. Rosso, "Continuous casting and Rolling of Thin Aluminum Sheets" Encyclopedia of Aluminum and Its Alloys, Two-Volume Set, Edited by George E. Totten, Murat Tiryakioglu, Olaf Kessler, Science CRC Press, (2018), pp. 2696-2706, ISBN 9781351045629.
2. I, Peter, M. Rosso, "Light alloys: from traditional to innovative technologies" in New Trends in Alloy Development, Characterization and Application, 3-38, InTech ed. (2015), ISBN 978-953-51-4216-4, DOI: 10.5772/60769.
3. I. Peter, "Metallic alloys for engineered applications", 1-106, ARA Publisher Academic Press, Address: P.O. Box 2761, Citrus Heights, CA 95611-2761 (2018), ISBN 978-1-935924-28-9.
4. M. Rosso, F. Calosso, I. Peter, "Grain growth on galvanic deposition of aluminium", Metalurgia International, pp. 15-18, (2011), Vol. 5, ISSN 1582-2214.
5. M. Rosso, I. Peter, "FEM analysis for tangible component production", Key Engineering Materials Vols. 611-612 (2014) pp 1657-1664, doi:10.4028/www.scientific.net/KEM.611-612.1657.
6. I. Peter, M. Rosso, I. Forno, "Numerical investigation for evaluation and prevention of casting defects", Key Engineering Materials Vols. 611-612 (2014) pp 1807-1814, doi:10.4028/www.scientific.net/KEM.611-612.1807.
7. I Peter, M. Rosso, "Evaluation of thixoforging process for steering piston production as possible alternative to hot forging" La Metallurgia Italiana 6 (2016) 125-128.
8. I. Peter, "Effect of Ionic Liquid Environment on the Corrosion Resistance of Al-Based Alloy" Key Engineering Materials Vol. 750, pp 97-102 (2017), doi:10.4028/www.scientific.net/KEM.750.97.
9. I. Peter, M. Rosso, S. Lombardo, "Sequential Casting of Functionally Graded Material" Key Engineering Materials Vol. 750, pp 153-158 (2017), doi:10.4028/www.scientific.net/KEM.750.153.
10. I. Peter, "Effect of Ionic Liquid Environment on the Corrosion Resistance of Al-Based Alloy" Key Engineering Materials Vol. 750, pp 97-102 (2017), doi:10.4028/www.scientific.net/KEM.750.97

11. I.Peter, M. Rosso, D. Suani, Desing and casting technology for Ti-Al-Nb-Ta alloy, Metalurgia International, 2013 Special Issue Nr. 5, Vol. 18, pp. 29-31, ISSN: 1582-2214.
12. . Peter, M. Rosso, A. Toppi, I. Dan, B. Ghiban, Investigation on cobalt based alloy modified by titanium for dental application, Archives of Materials Science and Engineering Vol. 61, Issue 2, June 2013, pp. 62-68, ISSN:1897-2764.
13. I.Peter, Mario Rosso, Dan Ioan, Brandusa Ghiban, Christian Castella, "Design and microstructure of innovative Cobalt base alloy, Materials Science Forum Vols. 790-791 (2014) pp. 235-240, doi:10.4028/www.scientific.net/MSF.790-791.235.
14. I. Peter, M. Rosso, "Study of Ti-enriched CoCrMo alloy for dental application", IEEE Access, The Journal for rapid open access publishing, Vol.3, 2015, pp. 73-80, doi 0.1109/ACCESS.2015.2398312.
15. A. Ghiban, B. Ghiban, I. Peter, M. Rosso, I. Dan, Tiganescu T.V., "Structural behaviour of CoCrMoTi(Zr) alloys for dental applications", Revista de Chimie Volume 67, Issue 6 (2016) 1131-1136.
16. V. Loscrì, L. Matekovits, I. Peter, A.M. Vegni, "In-body Network Biomedical Applications: from Modeling to Experimentation, IEEE Transactions on NanoBioscience, Vol.15, No.1, pp.53-61, (2016), DOI: 10.1109/TNB.2016.2521386.
17. I. Peter, E. Fracchia, I. Canale, R. Maiorano, "Incremental sheet forming for prototyping automotive modules", Procedia Manufacturing, Volume 32, 2019, pp. 50-58, https://doi.org/10.1016/j.promfg.2019.02.182.
18. I. Peter, Investigations into Ti-Based Metallic Alloys for Biomedical Purposes, Metals 2021, 11, 1626. https://doi.org/10.3390/met11101626.
19. I. Peter, M. Rosso, "Investigation on the evolution of the microstructure during homogenization in thin Al sheets", 13th International Conference on Aluminum Alloys, June 3-7, 2012, Carnegie Mellon University, Pittsburgh, Pennsylvania (USA).
20. I. Peter, M. Rosso, "From hot forging to thixoforging: FEM analysis of thixoforging process for steering piston production" Proc. of 13th International Conference on Semi-Solid Processing of Alloys and Composites, Muscat, Oman, September 15th - 17th, 2014.
21. I.Peter, B. Aldwell, R. Lupoi, M. Rosso, "Design and optimization of cold spray technique for conformal steel substrate", Proc. of the International Thermal spray Conference & Exhibition, May 10-12, 2016, Shanghai (China).
22. I.Peter, M. Rosso, "Evaluation of thixoforging process for steering piston production as possible alternative to hot forging", Proc. of the International Conference High Tech Die Casting 2016, 22-23 June 2016, Venice (Italy).

23. S. Lombardo, I. Peter, M. Rosso, “Gravity Casting of Variable Composition Al Alloys: Innovation and New Potentialities” Materials Today: Proceedings Volume 10, Pages 271 – 276 (2019) 10th Aluminium Two Thousand International Congress and 6th International Conference on Extrusion and Benchmark, ICEB 2017, 20 June 2017 - 24 June 2017, ISSN 22147853, DOI 10.1016/j.matpr.2018.10.406.
24. I.Peter, M. Rosso, “Investigation on the properties of multifunctional Ti-based alloy for load bearing implant development” Abstract book of the 6th International Conference on Mechanics of Biomaterials and Tissues (ICMOBT), 6-10 December 2015, Waikoloa, Hawaii, USA.
25. I. Peter, L. Matekovits, “Biometallic orthopedic implant with printed antenna” BODYNETS 2018 - 13th EAI International Conference on Body Area Networks October 2-3, 2018, Oulu, Finland.
26. I.Peter, L. Matekovits, “Biometallic orthopedic implant with printed antenna”, EAI/Springer Innovations in Communication and Computing Volume 3, Pages 393 – 397 (2020) 13th EAI International Conference on Body Area Networks, BODYNETS 2018, 2 October 2018 - 3 October 2018, ISSN 25228595, ISBN 978-303029896-8, DOI 10.1007/978-3-030-29897-5_34.
27. I. Peter, Investigations into Ti-Based Metallic Alloys for Biomedical Purposes, Metals 2021, 11, 1626. https://doi.org/10.3390/met11101626.

In the following, I will also present my **teaching activity, the coordination of (i) bachelor's and dissertation thesis and (ii) doctoral thesis, scientific papers published and presented at various scientific conferences, both nationally and internationally, and my participation, with different roles in research projects.**

The thesis ends with **directions for future research** and finally the list of **bibliographic references** is presented.

Iulian Boldea-Relea

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