



ADMISSION TO DOCTORAL STUDIES

Session September 2023

Field of doctoral studies: Materials engineering

Doctoral supervisor: Prof. dr. eng. Julia Claudia MIRZA ROSCA

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *Improving corrosion resistance of laser processed surfaces*

Content / Main aspects to be considered

- State of the art of laser deposition and laser welding
- Obtaining of different samples (deposition with different chemical compositions, welding under different conditions)
- Study of corrosion behaviour and mechanical properties of the obtained samples (structure, optical microscopy and SEM, hardness, elasticity modulus, corrosion resistance, long-term behaviour)
- Corrosion resistance characterisation in different aggressive industrial environments

Recommended bibliography:

1. STANCIU Elena Manuela, PASCU Alexandru, Laser welding, Ed. LuxLibris Braşov, ISBN 978-973-131-304-4, 2014.
2. Svelto O., Principles of lasers, 4th edition, Ed. Springer, ISBN: 978-1-4757-6266-2, 1998.
3. John C. Ion, Laser Processing of Engineering Materials, Elsevier Butterworth-Heinemann, ISBN: 0 7506 6079 1, 2005.
4. Avram, D. N., Davidescu, C. M., Dan, M. L., Mirza-Rosca, J. C., Hulka, I., Stanciu, E. M., and Pascu, A. (2023). Corrosion resistance of NiCr(Ti) coatings for metallic bipolar plates. *Materials Today: Proceedings*, 72, 538–543. <https://doi.org/10.1016/j.matpr.2022.09.007>
5. Stanciu, E. M., Pascu, A., Claudiu, I., Cristea, D., Tiorean, M. H., Hulka, I., Ioana, M., Claudia, J., and Rosca, M. (2023). Functional Surfaces via Laser Processing in Nickel Acetate Solution.
6. Roman, I. B., Tiorean, M. H., Baltes, L. S., and Mirza Rosca, J. (2014). The effect of laser shock processing on corrosion resistance of stainless steel AISI 316L. In *Solid State Phenomena* (Vol. 216). <https://doi.org/10.4028/www.scientific.net/SSP.216.210>

Prerequisites / Remarks: *studies in engineering, chemistry, physics, mathematics*

TOPIC 2: *New materials for possible applications in the medical field*

Content / Main aspects to be considered

- History of biomaterials (implants, prostheses, medical instruments)
- Techniques for characterizing new materials from a structural, mechanical and electrochemical behavior point of view in different environments (saline, artificial saliva, etc.) and different additional parameters (fever, cleaning products, etc.)

- Interpretation of the obtained results and ethical limitations of the use of new materials

Recommended bibliography:

1. Vasilescu, E., Drob, P., Popa, M. V., Anghel, M., Santana Lopez, A., and Mirza-Rosca, I. (2000). Characterisation of anodic oxide films formed on titanium and two ternary titanium alloys in hydrochloric acid solutions. *Werkstoffe Und Korrosion*, 51(6), 413–417. [https://doi.org/10.1002/1521-4176\(200006\)51:6<413::AID-MACO413>3.0.CO;2-3](https://doi.org/10.1002/1521-4176(200006)51:6<413::AID-MACO413>3.0.CO;2-3)
2. Bao, X., Li, X., Ding, J., Liu, X., Meng, M., and Zhang, T. (2022). Exploring the limits of mechanical properties of Ti-Zr binary alloys. *Materials Letters*, 318. <https://doi.org/10.1016/j.matlet.2022.132091>
3. Baltatu, M. S., Vizureanu, P., Sandu, A. V., Florido-Suarez, N., Saceleanu, M. V., and Mirza-Rosca, J. C. (2021). New Titanium Alloys, Promising Materials for Medical Devices. *Materials*, 14(20), 5934. <https://doi.org/10.3390/ma14205934>
4. Lucchetti, M. C., Fratto, G., Valeriani, F., and Vittori, E. De. (n.d.). Cobalt-chromium alloys in dentistry: An evaluation of metal ion release. *The Journal of Prosthetic Dentistry*, 114(4), 602–608. <https://doi.org/10.1016/j.prosdent.2015.03.002>
5. Fratila, A., Jimenez-Marcos, C., Mirza-Rosca, J. C., and Saceleanu, A. (2023). Mechanical properties and biocompatibility of various cobalt chromium dental alloys. *Materials Chemistry and Physics*, 304(January), 127867. <https://doi.org/10.1016/j.matchemphys.2023.127867>

Prerequisites / Remarks: *High Education Studies*

Doctoral supervisor,

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