



ADMISSION TO DOCTORAL STUDIES

Session September 2022

Field of doctoral studies: Materials engineering

Doctoral supervisor: Prof.dr.eng. Mircea Horia ȚIEREAN

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *Synthesis of nanoparticles by laser ablation*

Content / Main aspects to be considered

- *Obtaining Ag, Ti, Zn nanoparticles by ablation*
- *Characterization of the obtained nanoparticles*

Recommended bibliography:

1. Blažeka, D., Car, J., Krstulović, N., Concentration Quantification of TiO₂ Nanoparticles Synthesized by Laser Ablation of a Ti Target in Water. *Materials*, 2022, 15(9), 3146. <https://doi.org/10.3390/ma15093146>.
2. Dell'Aglio, M., Gaudio, R., De Pascale, O., De Giacomo, A., Mechanisms and processes of pulsed laser ablation in liquids during nanoparticle production, *Applied Surface Science*, 2015, 348, 4-9, <https://doi.org/10.1016/j.apsusc.2015.01.082>.
3. Amin, M., Tomko, J., Naddeo, J.J., Jimenez, R., Bubb, D.M., Steiner, M., Fitz-Gerald, J., O'Malley, S.M., Laser-assisted synthesis of ultra-small anatase TiO₂ nanoparticles, *Applied Surface Science*, 2015, 348, 30-37, <https://doi.org/10.1016/j.apsusc.2014.12.191>.
4. Gentile, L., Mateos, H., Mallardi, A. *et al.* Gold nanoparticles obtained by ns-pulsed laser ablation in liquids (ns-PLAL) are arranged in the form of fractal clusters. *J Nanopart Res*, 2021, 23, 35, <https://doi.org/10.1007/s11051-021-05140-5>.
5. Car, J., Blažeka, D., Bajan, T. *et al.* A quantitative analysis of colloidal solution of metal nanoparticles produced by laser ablation in liquids. *Appl. Phys. A*, 2021, 127, 838, <https://doi.org/10.1007/s00339-021-04966-z>.
6. Krstulović, N., Salamon, K., Budimlija, O., Kovač, J., Dasović, J., Umek, P., Capan, I., Parameters optimization for synthesis of Al-doped ZnO nanoparticles by laser ablation in water, *Applied Surface Science*, 2018, 440, 916-925, <https://doi.org/10.1016/j.apsusc.2018.01.295>.
Nikov, Ro.G., Nedyalkov, N.N., Karashanova, D.B., Laser ablation of Ni in the presence of external magnetic field: Selection of micro-sized particles, *Applied Surface Science*, 2020, 518, 146211, <https://doi.org/10.1016/j.apsusc.2020.146211>.

Prerequisites / Remarks: *Graduation in: Engineering, Physics, Chemistry, Mathematics, Computer Science*

TOPIC 2: *The influence of materials and technological parameters on properties of 3D printed parts obtained by Fusion Deposition Modeling*

Content / Main aspects to be considered

- *Structural, mechanical, calorimetric characterization*
- *Porosity tests*
- *Characterization of biocompatibility (penetrability of microorganisms, cell growth, disinfection)*

Recommended bibliography:

1. Anderson, E.H., The Effect of Porosity on Mechanical Properties of Fused Deposition Manufactured Polymers and Composites, 2019, Master's Theses. 4992, <https://doi.org/10.31979/etd.rkaj-q4tv>.
2. Carneiro, O.S., Silva A.F., Gomes, R., Fused deposition modeling with polypropylene, *Materials & Design*, 2015, 83, 768–776, <https://doi.org/10.1016/j.matdes.2015.06.053>
3. Chacón, J.M., Caminero, M.A., García-Plaza, E. P., Núñez, J., Additive manufacturing of PLA structures using fused deposition modelling: Effect of process parameters on mechanical properties and their optimal selection, *Materials & Design*, 2017, 124, 143–157, <https://doi.org/10.1016/j.matdes.2017.03.065>
4. Ferreira, R.T.L., Cardoso Amatte, I., Assis Dutra, T., Bürger, D., Experimental characterization and micrography of 3D printed PLA and PLA reinforced with short carbon fibers, *Composites Part B*, 2017, 124, 88–100, <https://doi.org/10.1016/j.compositesb.2017.05.013>.
5. Gordeev, E.G., Galushko, A.S., Ananikov, V.P., Improvement of quality of 3D printed objects by elimination of microscopic structural defects in fused deposition modeling, *Plos One*, 2018, <https://doi.org/10.1371/journal.pone.0198370>.
6. Liao, Y., Liu, C., Coppola, B., Barra, G., DiMaio, L., Incarnato, L., Lafdi, K., Effect of Porosity and Crystallinity on 3D Printed PLA Properties, *Polymers*, 2019, 11(9):1487, <https://doi.org/10.3390/polym11091487>.
7. Song, Y., Li, Y., Song, W., Yee, K., Lee, K.-Y., Tagarielli, V.L., Measurements of the mechanical response of unidirectional 3D-printed PLA, *Materials and Design*, 2017, 123, 154–164, <https://doi.org/10.1016/j.matdes.2017.03.051>.
8. Srivastava, V.K., A Review on Advances in Rapid Prototype 3D Printing of Multi-Functional Applications, *Science and Technology* 2017, 7(1): 4-24, <http://article.sapub.org/10.5923.j.scit.20170701.02.html>.
9. Tanikella, N.G., Wittbrodt, B., Pearce, J.M., Tensile strength of commercial polymer materials for fused filament fabrication 3D printing, *Additive Manufacturing*, 2017, 15, 40–47, <https://doi.org/10.1016/j.addma.2017.03.005>.
10. Zekavat, A R., Jansson, A., Larsson, J., Pejryd, L., Investigating the effect of fabrication temperature on mechanical properties of fused deposition modelling parts using X-ray computed tomography, *The International Journal of Advanced Manufacturing Technology*, 2018, 100, 287–296, <https://doi.org/10.1007/s00170-018-2664-8>.

Prerequisites / Remarks: *to be adapted/ completed/ deleted*

Doctoral supervisor,

Prof.dr.eng. Mircea Horia ȚIEREAN

Coordinator of the field of doctoral studies,

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