BIOMATERIALS RESEARCH GROUP

Contact details

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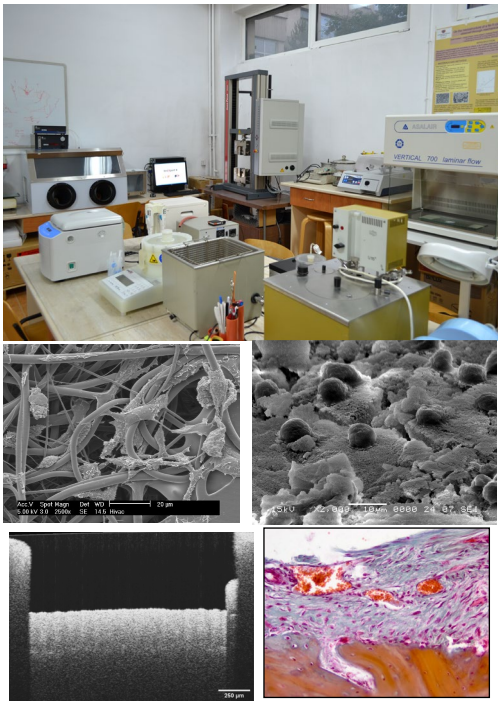

Areas of expertise

Biomaterials
- Synthesis and characterization of biomaterials designed for soft / hard tissue implants; functionalization of implants surface in view of a designed body reaction; titanium-base structures with ultralow Young's modulus and / or osseintegration optimized surface.

Tissue Engineering
- Synthesis and characterization of scaffolds designed for the growth of tissue from stem / primary cells; design and manufacturing of synthetic – tissue hybrid materials for grafts; synthesis of drug delivery systems / biologically active hydrogel-base microspheres.

Medical Microfluidics
- Design, additive manufacturing and testing of microfluidic devices for cells selection / culturing. Paper microfluidic devices for the selection and controlled actuation of biologic fluids.

Team

Prof. Dr. Eng. Cătălin Popa, Dr. Eng. Violeta Pașcalău, Lect. Dr. Eng. Violeta Merie, Lect. Dr. Eng. Gabriel Batin, Eng. Alexandra Csapai, Eng. Razvan Lupse, Eng. Victor Tosa

Representative projects

IMPROVE **–** "**Development of robot assisted minimally-invasive treatment methods through brachytherapy and target delivered drugs for non-resecable liver tumours**", PN-III-P1-1.2-PCCDI-2017-0221/59PCCDI/2018 (2018 – 2020);
STEMREG – "**Hybrid composite grafts obtained through Tissue Engineering and stem cells with application in Regenerative Medicine"**, PN II Partnerships (2012 – 2016);
BIOMAPIM – "**New biocompatible materials manufactured through SLS and SLM"**, PN II Complex Ideas (2010 – 2013);
BIOINTECH – "**Application of Tissue Engineering innovative methods in the pathology of digestive tube – multidisciplinary approach"**, PN II, Partnerships (2008 – 2011;
"Neutron Reflectivity Study of the Response of Membrane Proteins in Model Bilayers to AC Fields", ISIS Beamtime Application RB720167, 2007, U.K.
"Composite biomaterials for radiotherapy and simultaneous hyperthermia", CEEX 100/2006;
"Innovative methods in the reconstructive surgery of cancer patient – composite tissue grafting and employment of biocompatible synthetic materials", CEEX 109/ 2006;
"Optimization of the management for the polytraumatised patient through therapeutic protocols of miniinvasive methods and through the use of biocompatible materials in the reconstruction of tissue or organ post-traumatic

defects", CEEX 145/ 2006;
"Functionalized conjugated polymers – based nanostructures and related nanocomposites", CEEX 12/ 2005;
"Microfluidics with Electrode Integration for Blood Cells Dynamic Studies", EPSRC Grant IRC A1 B3R (IRC, Queen Mary, University of London), 2005;
"Porous nanocrystalline silicon – polypyrole multi-layered materials destined to the selective dielectrophoresis of blood cells", Matnantech 208(403)/2004;
"Functionally graded biomaterials, biomimetically structured, destined to personalised endosseous implants", Matnantech 163(303)/2003;

Significant results

The most representative publications of the past 5 years:

1. A. Csapai, D.A. Toc, F. Popa, N. Tosa, V. Pascalau, C. Costache, A. Botan, C. Popa, 3D Printed Microfluidic Bioreactors Used for the Preferential Growth of Bacterial Biofilms through Dielectrophoresis, Micromachines 2022, *13*(9), 1377**;**
2. A, Csapai, D.A. Toc, V. Pascalau, N. Tosa, S. Tripon, A. Ciorita, R.M. Mihaila, B. Mociran, C. Costache, C. Popa, Study of the Influence of the Dielectrophoretic Force on the Preferential Growth of Bacterial Biofilms in 3D Printed Microfluidic Devices, Applied Sciences 2023, 11, Article Number 60;
3. G. Dindelegan, A. Caziuc, I. Brie, O. Soritau, M.G. Dindelegan, V. Bintintan, V. Pascalau, C. Mihu, C. Popa,
4. Multilayered Porous Titanium-Based 3rd Generation Biomaterial Designed for Endosseous Implants, Materials 2021, 14(7), Article Number 1727;
5. V. Paşcalău, C. Bogdan, E. Pall, S. Matroş, Pandrea, M. Suciu, G. Borodi, C. Iuga, R. Ştiufiuc, T. Topală, C. Pavel, C. Popa, M. Moldovan, Development of BSA gel/Pectin/Chitosan polyelectrolyte complex microcapsules for Berberine delivery and evaluation of their inhibitory effect on Cutibacterium acnes, Reactive and Functional Polymers 2020, 147, Article number 104457;
6. V. Paşcalău, M. Tertis, E. Pall, M. Suciu, T. Marinca, M. Pustan, V. Merie, I. Rus, C. Moldovan, T. Topala, C. Pavel, C. Popa, Bovine serum albumin gel/polyelectrolyte complex of hyaluronic acid and chitosan based microcarriers for Sorafenib targeted delivery, Journal of Applied Polymer Science 2020, Article number 49002;
7. V. Paşcalău, E. Pall, M. Tertis, M. Suciu, C. Cristea, G. Borodi, A. Bodoki, T. Topala, R. Stiufiuc, A. Moldovan, C. Pavel, T. Marinca, C. Popa, In vitro study of BSA gel/polyelectrolite complexes core shell microcapsules encapsulating doxorubicin for antitumoral targeted treatment, International Journal of Polymeric Materials and Polymeric Biomaterials 2019, 68(1-3), 60-72;
8. V. Paşcalău, G. Dindelegan, N. Dirzu, A.-M. Salantiu, C. Pavel, M. Dudescu, F. Popa, G. Borodi, F. Tabaran, C. Iuga, C. Popa, Bioactive Ti-base biomaterial with sustained anti-bacterial response for endosseous applications, Reactive and Functional Polymers 2018, 125, 37-46;

Significant solutions:
Design – synthesis – characterisation of controlled porosity PM titanium for endosseous implants;
Functionalization of titanium implants for enhancing osseointegration;
Functionalization of surgical meshes in view of controlled tissue adhesion;
Design – synthesis – characterisation of biodegradable polymers scaffolds for culturing cells / organelles;
Design - synthesis of delivery systems for active agents in Tissue Engineering and wound healing;
Design, manufacturing and testing of medical microfluidic devices;
Design, manufacturing and testing of medical applications of paper microfluidics.
Technologies:

1. PM processing of titanium and titanium – base alloys;
2. Synthesis of drug / active factors containing microspheres;
3. Electrospinning of composite structures;
4. Sol-gel coating and surface conditioning of metallic biomaterials;
5. Additive manufacturing of complex microfluidic systems;
6. Microfluidic devices on various types of paper ;

Patents:
C. Popa, L. Cont, G. Dindelegan, V. Simon, I. Brie, C. Pavel, V. Candea – Method for the manufacturing of scaffolds and composite materials destined to Tissue Engineering, RO patent Nr. 127534;

The offer addressed to the economic environment

Research & development	Design and synthesis of new bioactive or hybrid materials for implants / grafts; Development of application designed complex structures for medical accessories: dental and maxillary-facial implants, orthopedic implants, "wound dressing", personalized medical instruments, surgical clips and staples; Development of new 3D scaffolds for the seeding of stem / primary cells / organelles in view of growing tissue / organ grafts; Development of new drug delivery systems with applications in Tissue Engineering, cancer, wound healing, diabetes, postoperative therapy; Development of microfluidic devices for the active selection / separation of live cells;
Consulting	Improvement of constructive / technologic design for dental, maxillary-facial and orthopaedic implants; consultancy in the field of materials and technologies for medical units.

Last updated: January 2023