The Faculty of Technology and Metallurgy, University of Belgrade, is one of the leading higher education and scientific research institutions in the country and in the region, with a rich tradition and significant contributions in the fields of chemical, biochemical, electrochemical, and materials engineering.

There are five research groups at the faculty that are currently engaged in the biomaterials research work.

01 Wounds dressings

02 Bone tissues implants

03 Biomaterials for dental applications

04 Controlled release systems

05 Biomimetic bioreactors

06 3D systems for cancer research

Prof. Dr. Bojana Obradović
bojana@tmf.bg.ac.rs

Karnegijeva 4
Belgrade, Serbia

excellmater.tmf.bg.ac.rs

ExcellMater

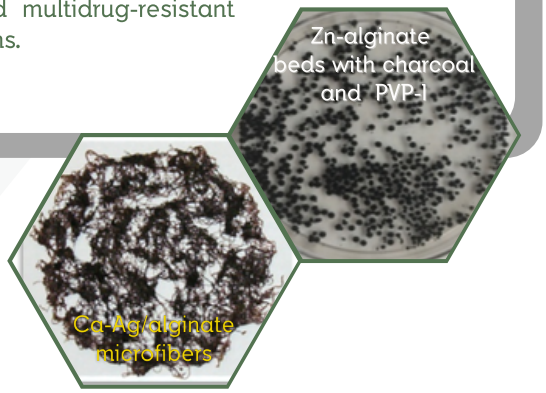
- Twinning to excel materials engineering for medical devices -

European Union's Horizon 2020 research and innovation programme
grant No 952033

Which biomaterials designed and developed at the Faculty of Technology and Metallurgy could be commercialized and utilized in clinical practice in the near future?

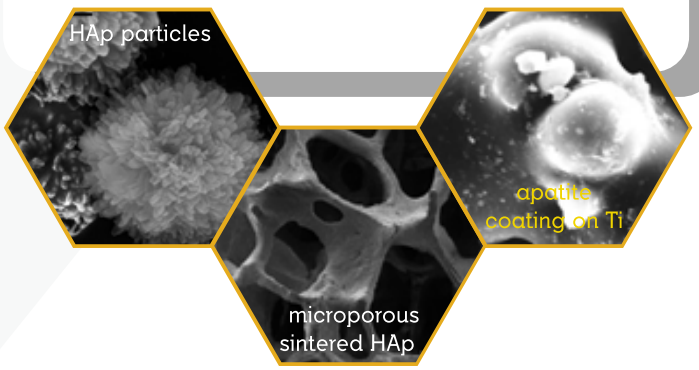
Wound dressings

A new generation of wound dressings is developed based on different hydrogels: Ca/Zn-alginate, PVA, PVP containing various bioactive components(nanoAg, activated charcoal with adsorbed povidone-iodine, honey). These dressings are aimed for the treatment of deep and infected wounds providing high sorption capacity and strong antimicrobial activity against standard and multidrug-resistant clinical strains.



Bone tissue implants

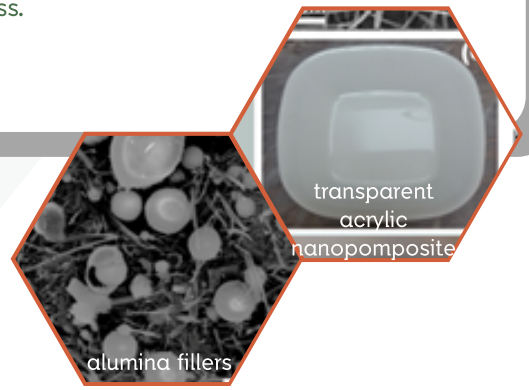
- Bioceramic - based on bioactive nanoparticles (HAp, β-TCP, bioactive glass) obtained by different proceedings technics (e.g. sintering, hot pressing).
- Composites - based on hydrogels (alginate, PVA, gellan gum) with incorporated bioactive inorganic components.
- Bioceramic coatings - electrochemically deposited bioactive coatings on Ti (Ag/HAp/lignin, HAP/chitosan/graphene/gentamicin).



Biomaterials for dental applications

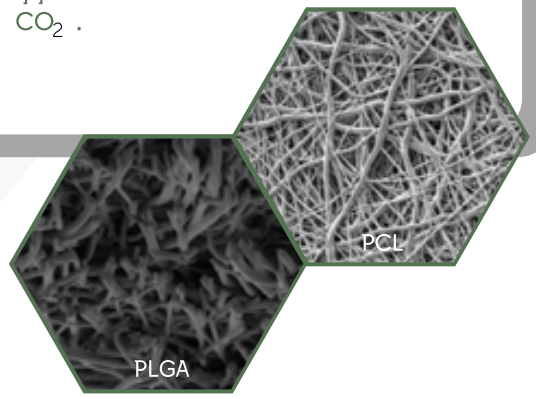
Materials with improved mechanical properties:

- alumina obtained by electrospinning was investigated as a potential filler for the improvement of hybrid composites based on PMMA;
- hybrid acrylic nanocomposites with excellent transparency and a balanced ratio of hardness and toughness.



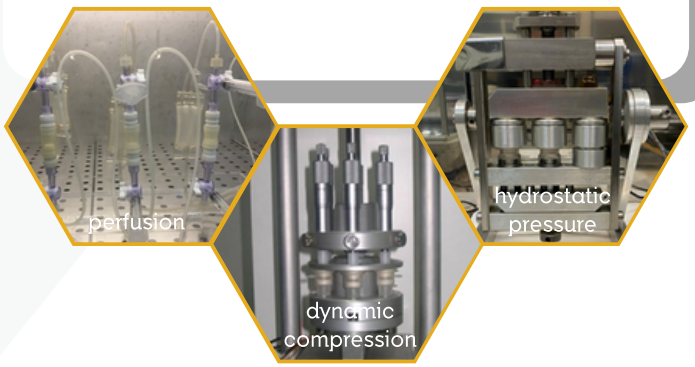
Controlled release systems

Smart polymer materials are synthesized for applications in medicine and pharmacy. Release of active substances is controlled by changing the composition, shape, and size. These materials are obtained by electrospinning or 3D printing, while encapsulation of active components could be achieved by application of supercritical CO_2 .



Biomimetic bioreactors

Biomimetic bioreactors imitating the physiological environment find applications in tissue and cancer engineering, as well as in characterization of novel biomaterials.
Three types of bioreactors have been developed:
- perfusion bioreactor,
- bioreactor with dynamic compression,
- bioreactor with hydrostatic pressures.



3D systems for cancer research

Systems for 3D cancer cell cultures are based on biomaterials (alginate hydrogels/composites) imitating extracellular matrix and a perfusion bioreactor providing efficient transport of nutrients and active substances. These systems are attractive for more relevant antitumor drug testing and development of personalized medical therapies.