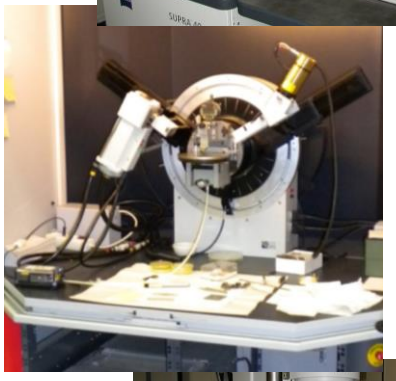
UNIVERSITÀ POLITECNICA DELLE MARCHE

MULTIFUNCTIONAL MATERIALS FOR INNOVATIVE REGENERATIVE STRATEGIES (MIME)

Paolo Mengucci

Department of Science and Engineering of Materials, Environment and Urban Planning (SIMAU) – www.univpm.it

Supervisor: Prof. Paolo Mengucci
Physics of Condensed Matter Group



Prof. PAOLO MENGUCCI, PhD,

Full Professor in Experimental Physics

Head of the Physics of Condensed Matter Group and Director of the Centre for Electron Microscopy (CISMIN), a facility based in the Faculty of Engineering.

Co-author of more 200 publications in the field of condensed matter physics, biomaterials, additive manufacturing, nanomaterials, light metal alloys, thin films and multilayers. https://orcid.org/0000-0001-9049-8524 (Publication List, H-index = 27)

The research group

People

- 2 full professors
- 1 associate professor
- 1 assistant professor
- 2 technicians
- 2 post-docs
- 2 PhD students

Expertise

- Scanning electron microscopy (SEM)
- Transmission electron microscopy (TEM)
- Energy dispersive microanalysis (EDX)
- X-ray diffraction (XRD, GID)
- X-ray reflectometry (XRR)
- Photoelasticity (PE)
- Microtomography (XCT)
- Synchrotron radiation
- Neutron scattering

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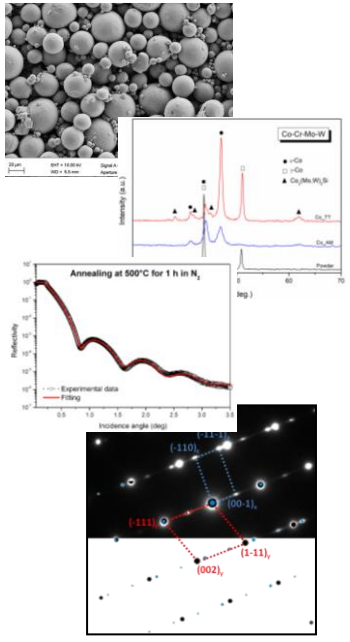


Equipment

SEM, HRSEM, TEM, XRD, XRR, SAXS, XCT, full equipped lab for sample preparation

Research Keywords

- Biomaterials
- Additive manufacturing
- Resorbable devices
- Surface treatments
- Mechanical behavior
- Materials characterization

European fundings

- EU – H2020 Factory of the Future (FOF) 13-2016: Photonics Laser-based production. “Driving up Reliability and Efficiency of Additive Manufacturing (DREAM)”
- EU – Progetto COST “Fast Advanced Scintillator Timing (FAST)”
- EU – Progetto COST “From NAno to MAcro BIOmaterials (NAMABIO)”

National fundings

- Cariverona – “Acquisto di un sistema EDX”
- FIRB - "NANOREST - Controllo dell'anisotropia magnetica di nanostrutture”
- Cariverona – “Acquisto HRSEM con sistema di microanalisi EDS”
- PRIN - “Caratterizzazione microstrutturale di leghe leggere mediante tecniche TEM, SANS e SAXS”
- PNRR – «Vitality»

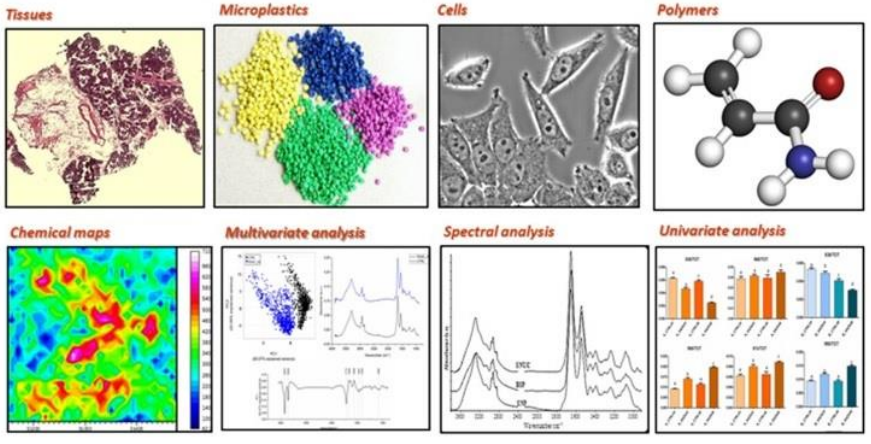
Department of Science and Engineering of Matter, Environment and Urban Planning (SIMAU)

(http://simau.univpm.it/)

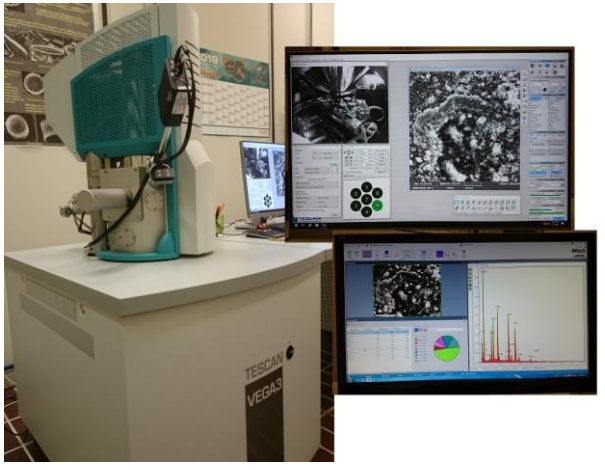
Structure in which the **confluence of different expertise** yields high-level teaching and high-profile international research in the field of **Science of Matter** and **Earth Sciences** with a special focus on the **Environment**.

It operates within the **Engineering Faculty** offering teachers specialised in the so-called «hard sciences» (**Chemistry** and **Physics**) as well as theachers involved in more «applicative» fields, such as **Materials Engineering**, **Geotechnics**, **Geology**, **Environmental Engineering** and **Urban Planning**.

- **TECHNICAL ARCHITECTURE**
- **APPLIED GEOLOGY AND HYDROGEOLOGY**
- **ENVIRONMENTAL CHEMICAL ENGINEERING**
- **GEOTECHNICAL ENGINEERING**



Research Areas



- **CHEMISTRY (ORGANIC)**
- **MATERIALS SCIENCE AND TECHNOLOGY**
- **EXPERIMENTAL PHYSICS**

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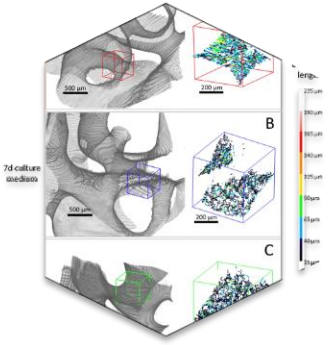
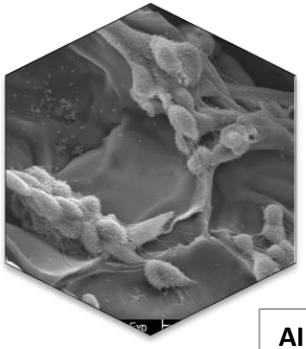
Project Idea

Multifunctional Materials for Innovative Regenerative Strategies (MIME)

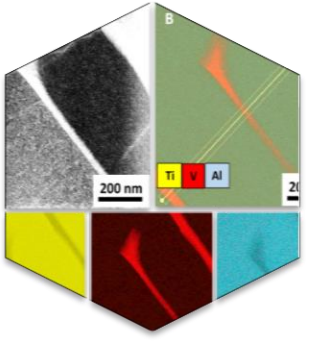
BACKGROUND
Regenerative therapies are becoming a major target both for emerging and aging countries, all over the world. In this context, from the scientific, industrial, and economic points of view, in short and medium term (1 to 3 years), there is a growing interest in increasing the clinical performances of resorbable implants, through implementing a holistic and integrated approach encompassing material fabrication, surface modification and biological validation..





PILLARS
- Material selection
- Design optimization
- Additive manufacturing
- Surface functionalization
- Nanostructural characterization
- Mechanical testing
- Biological testing

AIMS
- 3D printing of devices with enhanced functionalities for bioresorbable implants for dental and orthopedic applications.
- Surface functionalization of the bioresorbable devices by multifunctional coatings developed for on-demand personalized devices.
- Validation of materials and coatings by assessing their biological performances through standardized cytocompatibility, hemocompatibility, and bacterial tests.



Activity developed in collaboration with

- LBB – LAVAL University (Canada) www.lbb.ulaval.ca
- Dept. of Engineering – UNIMORE www.ingmo.unimore.it
- Dept. DISCLIMO – UNIVPM www.disclimo.univpm.it