Research Group

Advanced materials Laboratory- ADMALAB

Reference year:

2025

Scientific Coordinator:

AVERSA Raffaella / Full Professor / Dipartimento di Architettura e Disegno Industriale / Università degli Studi della Campania "Luigi Vanvitelli"

Group members:

RICCIOTTI Laura/ Researcher / Dipartimento di Architettura e Disegno Industriale / Università degli Studi della Campania "Luigi Vanvitelli"
IANNACE Gino / Associate Professor / Dipartimento di Architettura e Disegno Industriale / Università degli Studi della Campania "Luigi Vanvitelli"
GUADAGNUOLO Maria Teresa/ Associate Professor / Dipartimento di Architettura e Disegno Industriale / Università degli Studi della Campania "Luigi Vanvitelli"
FEMIANO Felice / Full Professor/ Dipartimento Multidisciplinare di Specialità Medico-Chirurgiche e Odontoiatriche/ Università degli studi della Campania "Luigi Vanvitelli"
PERROTTA Valeria / Research fellow / Dipartimento di Architettura e Disegno Industriale / Università degli Studi della Campania "Luigi Vanvitelli"
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Mohamed Amine BENZIADA, PhD student, University of science and Technology "H. Boumedienne", Algers, Algeria
Professor CHAO Wang / Beihang University, Beijing, School of Biological Science and Medical Engineering, China;
Professor Djamel MIRAUD/ University of science and Technology "H. Boumedienne", Algers, Algeria;
Professor Ismail DAOUD/ University of science and Technology "H. Boumedienne", Algers, Algeria;
Professor Mustafa S. ABDALLAH/Professor/Arab Academy for Science, Technology and Maritime Transport (AASTMT).

Description of research lines:

The working group that operates in the laboratory is made up of teachers, contractors, research fellows and PhD students who are interested in the development and characterization of advanced materials (biomaterials, nanomaterials, glassy metals, surface treatments, shape memory alloys), technology transfer from advanced biomedical and aerospace sectors for Industrial Design and Sustainable Product Design and Production products.

The laboratory is currently involved in research activities on:
- biomechanics and biomimetics;
- development of new low-invasive prosthetic systems with trabecular metal structure sintered;
- application of additive technologies (3D printing) of metal components;
- design of biomimetic metal trabecular structures;
- scaffolds for tissue engineering;
- mechanical and calorimetric characterization of polymeric and composite materials; - processing techniques for polymeric and composite materials;
- smart materials based on Shape Memory Alloy.
- Geopolymers and ceramics

Relationships with other research groups of the University of Campania L. Vanvitelli during the last three years:

Research activity in progress with prof. Felice Femiano of the Multidisciplinary Department of Medical-Surgical and Dental Specialties. Evaluation of physical and chemical surface treatments on dental enamel with electron microscopy and atomic force microscopy investigations, differential calorimetry and mechanical characterization.

Participation in research projects during the last three years:

1. *GEA: Geopolymers for Environmentally-friendly Architecture: A Chemo-rheology and Thermo-kinetic investigation for the development of 3D Printable formulations.*
   PI: Dott.ssa Laura Ricciotti

2. *BioSafety*
   PI: Prof.Raffaella Aversa
   Call: INAIL, BRIC 2022

3. *BIOSAFE*
   PI: Prof.Raffaella Aversa
   Call: MAECI, Cooperation research Italy-China

4. *IR and visible light-activated antimicrobial properties and biosafety of new self-sterilizing non-stoichiometric metal oxides/polymer hybrid hydrogels for tissue engineering*
   PI: Prof. Raffaella Aversa
   Call: MIUR - PRIN 2022

Scientific products during the last three years:
10 scientific publications in Class A journals and/or indexed in the Scopus/WoS databases:

[1] Aversa, R.; Ricciotti, L.; Perrotta, V.; Apicella, A., Thermokinetic and Chemorheology of the Geopolymerization of an Alumina-Rich Alkaline-Activated Metakaolin in Isothermal and

Dynamic Thermal Scans. Polymers, (2024), 16, 211. https://doi.org/10.3390/polym16020211.
[2] Ciaburro, G., Iannace, G., Ricciotti, L., Apicella A., Perrotta, V., Aversa, R., Acoustic Applications of a Foamed Geopolymeric-Architected Metamaterial, Applied Sciences (Switzerland), (2024), 14(3), 1207, DOI: 10.3390/app14031207.
[3] Liu W., Zheng L., Wang C., Yin H., Aversa, R., Apicella A., Ji P., Zhang H., Fan Y., Additively manufactured bioceramic scaffolds with 3D architecture for vertical bone augmentation: A proof-of- concept study, Materials and Design, (2024), 239, art. no. 112749, DOI: 10.1016/ j.matdes.2024.112749.
[4] Ricciotti, L., Apicella, A., Perrotta, V., Aversa, R., Geopolymer Materials for Extrusion-Based 3D- Printing: A Review (2023) Polymers, 15 (24), art. no. 4688.
[5] Meng, X., Wang, C., Xu, W., Wang, R., Zheng, L., Wang, C., Aversa, R., Fan, Y. Effects of different designs of orthodontic clear aligners on the maxillary central incisors in the tooth extraction cases: a biomechanical study, (2023) BMC Oral Health, 23 (1), art. no. 416, . Cited 1 time.
[6] Aversa, R., Perrotta, V., Wang, C., Apicella, A., Bio-Resorption Control of Magnesium Alloy AZ31 Coated with High and Low Molecular Weight Polyethylene Oxide (PEO) Hydrogels, (2023) Gels, 9 (10), art. no. 779.
[7] Aversa, R., Ricciotti, L., Perrotta, V., Apicella, A., Chemorheology of a Si/Al> 3 Alkali Activated Metakaolin Paste through Parallel Differential Scanning Calorimetry (DSC) and Dynamic Mechanical Analysis (DMA), Faculty of Mechanical and Process Engineering (FGMGP) Houari Boumediene University of Science and Technology, USTHB, (2023) Polymers, 15 (19), art. no. 3922, . Cited 1 time.
[8] Zheng, L., Chen, D., Wang, C., Ai, L., Li, Y., Hu, M., Aversa, R., Wang, L., Fan, Y., Comparative evaluation of personalized 3D-printed scaffold-driven double barrel fibula flap for the reconstruction of segmented mandibular defects (2023) Materials and Design, 234, art. no. 112310.
[9] Aversa, R., Franchino, R., Frettoloso, C., Pisacane, N., Ricciotti, L., GEOPOLYMERS FOR ECO- ARCHITECTURE Integrated approaches for green strategies activation (2023) Agathon, 13, pp. 237-246. Cited 1 time.
[10] Ricciotti, L., Apicella, A., Perrotta, V., Aversa, R., Geopolymer Materials for Bone Tissue Applications: Recent Advances and Future Perspectives (2023) Polymers, 15 (5), art. no. 1087, Cited 7 times.

Additional 10 scientific products:

[1] Aversa, R.; Ricciotti, L.; Perrotta, V.; Apicella, A., Thermokinetic and Chemorheology of the Geopolymerization of an Alumina-Rich Alkaline-Activated Metakaolin in Isothermal and Dynamic Thermal Scans. Polymers, (2024), 16, 211. https://doi.org/10.3390/polym16020211.
[2] Ciaburro, G., Iannace, G., Ricciotti, L., Apicella A., Perrotta, V., Aversa, R., Acoustic Applications of a Foamed Geopolymeric-Architected Metamaterial, Applied Sciences (Switzerland), (2024), 14(3), 1207, DOI: 10.3390/app14031207.
[3] Liu W., Zheng L., Wang C., Yin H., Aversa, R., Apicella A., Ji P., Zhang H., Fan Y., Additively manufactured bioceramic scaffolds with 3D architecture for vertical bone augmentation: A proof-of- concept study, Materials and Design, (2024), 239, art. no. 112749, DOI: 10.1016/ j.matdes.2024.112749.
[4] Ricciotti, L., Apicella, A., Perrotta, V., Aversa, R., Geopolymer Materials for Extrusion-Based 3D- Printing: A Review, (2023) Polymers, 15 (24), art. no. 4688.
[5] Meng, X., Wang, C., Xu, W., Wang, R., Zheng, L., Wang, C., Aversa, R., Fan, Y., Effects of different designs of orthodontic clear aligners on the maxillary central incisors in the tooth extraction cases: a biomechanical study, (2023) BMC Oral Health, 23 (1), art. no. 416, . Cited 1 time.
[6] Aversa, R., Perrotta, V., Wang, C., Apicella, A., Bio-Resorption Control of Magnesium Alloy

AZ31 Coated with High and Low Molecular Weight Polyethylene Oxide (PEO) Hydrogels, (2023) Gels, 9 (10), art. no. 779.

[7] Aversa, R., Ricciotti, L., Perrotta, V., Apicella, A., Chemorheology of a Si/Al> 3 Alkali Activated Metakaolin Paste through Parallel Differential Scanning Calorimetry (DSC) and Dynamic Mechanical Analysis (DMA), (2023) Polymers, 15 (19), art. no. 3922, . Cited 1 time.

[8] Zheng, L., Chen, D., Wang, C., Ai, L., Li, Y., Hu, M., Aversa, R., Wang, L., Fan, Y., Comparative evaluation of personalized 3D-printed scaffold-driven double-barrel fibula flap for the (2023) Materials and Design, 234, art. no. 112310.

[9] Ricciotti, L., Apicella, A., Perrotta, V., Aversa, R., Geopolymer Materials for Bone Tissue Applications: Recent Advances and Future Perspectives, (2023) Polymers, 15 (5), art. no. 1087,Cited 7 times.

[10] Wang, L., Aversa, R., Houa, Z., Tian, J., Liang, S., Ge, S., Chen, Y., Perrotta, V., Apicella, A., Apicella, D., Cioffi, L., Wang, G., Bioresorption control and biological response of magnesium alloy az31 coated with poly-β-hydroxybutyrate, (2021) Applied Sciences (Switzerland), 11 (12), art. no. 5627.

Relationships with international and national Companies, Institutions, Research Centers, Universities during the last three years:

A.I.R.M. Aided Industries Recycling Materials, Spin off Accademico

- Adler Ortho, Cormano Milan - Research and collaboration agreements on 3D printing
- University of science and Technology "H. Boumedienne", Algers, Algeria;
- Arab Academy for Science, Technology and Maritime Transport (AASTMT), Alexandria, Egypt

-Beihang University, Beijing, School of Biological Science and Medical Engineering, China
-East China University of Science and Technology, Shanghai China
-Sant'Anna University of Pisa.

Collaborations with Consortia, Scarl or other Institutions participated by the University of Campania Luigi Vanvitelli during the last three years:

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ISI Web of Science Subject Categories:

Engineering, Biomedical
Polymer Science
Materials Science, Biomaterials
Materials Science, Characterization & Testing
Materials Science, Composites
Materials Science, Multidisciplinary Materials Science, Ceramics

Scientific-Disciplinary Sectors:

IMAT 01
CEAR-07/A
CEAR-11/A
IIND-07/B

Keywords:

Biomechanics
Biomimetics
New biocompatible materials Scaffolds
Additive technologies
Geopolymers and ceramics
Metamaterials
Acustic Materials characterization

ERC Categories:

PE5-7
PE8-8
PE8-9
PE11-1,2,3,4,5,10,11