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Marco Sebastiani

Date of birth: 04/09/1978 | **Nationality:** Italian | **Phone number:** (+39) 0657333303 (Work) |

Email address: seba@uniroma3.it | **Website:** https://stm.uniroma3.it/ | **LinkedIn:**

https://www.linkedin.com/in/marco-sebastiani-0110302/ |

Address: via della Vasca Navale 79, 00146, Rome, Italy (Work)

WORK EXPERIENCE

29/02/2020 – CURRENT Rome, Italy

ASSOCIATE PROFESSOR OF MATERIALS SCIENCE UNIVERSITÀ DEGLI STUDI ROMA TRE

Marco Sebastiani is a worlwide recognised scientist in the fields of materials science, surface engineering, thin film synthesis, and nanoscale mechanical characterisation in advanced materials.
In the last ten years, he has been **awarded with a Fulbright Scholarship,** and have already participated to six large **European projects** (**two as coordinator**), and two large national projects (PRIN2020 as **coordinator**, and a large research infrastructure project as **unit leader**).
He is **editor** of the international journal "Materials and Design" (I.F. 9.417), and co-founder and member of the *European Materials Characterisation Council* (EMCC).
According to Scopus, the PI has published **118 articles**, with **> 5500 citations**, **h-index = 33**.
According to Google Scholar (where also conference proceedings are present), the PI has published **177 articles**, with **> 4000 citations**, **h-index = 37, i10-index = 77**.

Main Project Achievements (from most recent):

- **Main co-proponent and unit leader (Roma Tre unit) of the PNRR project iENTRANCE@ENL** (Missione 4, Componente 2, del PNRR), Infrastructure for ENergy TRAnsition aNd Circular Economy @ EuroNanoLab.
- **Work Package LEadern the EU project DigiCell** (G.A.N. 101135486)
- **Work Package leader in the EU project MIRIA** (G.A. N. 101058751)
- **Work Package leader in the EU project COBRAIN** (G.A. N. 101092211)
- **Coordinator of the PRIN2020 project CONCERTO**
- **Work Package leader in the EU project NANOMECOMMONS** (G.A. N. 952869)
- **Coordinator of the EU project OYSTER** (G.A. N. 760827)
- **Coordinator of the EU project ISTRESS** (G.A. N. 604646)

International recognition, scientific awards, academic memberships (2014-2024):
2023 - Included in top2% Most Influential Scientists, Stanford University
2023 - Research of the PI highlighted on **IL SOLE 24 ORE**, **the major Italian daily business newspaper.**
2019 - Research of the PI highlighted on **TG1/RAI**, http://www.teche.rai.it/techecustomer/tg1-materiali-autopulenti-autorigeneranti/
2016 - Research of the PI highlighted on **PLATINUM – ricerca e innovazione**

Granted Patent:
2012 **M. Sebastiani** "Method for measuring the Poisson's ratio and the residual stress in materials" *RM2012A000017. **International Patent n. PCT/IB2013/050440,*** Patent Numbers: WO2013108208-A1 ; KR2014119724-A ; IT1411052-B ; EP2805145-A1.

31/12/2014 – CURRENT London, United Kingdom

EDITOR OF MATERIALS AND DESIGN ELSEVIER

https://www.sciencedirect.com/journal/materials-and-design/about/editorial-board

01/11/2021 – CURRENT Rome, Italy

DEPUTY DIRECTOR FOR RESEARCH OF THE ENGINEERING DEPARTMENT (UNIVERSITÀ DEGLI STUDI ROMA TRE) UNIVERSITÀ DEGLI STUDI ROMA TRE

Since November 2021, prof. Marco Sebastiani was appointed as deputy director of the engineering department at Roma Tre university, where he is responsible for the coordination of research activities, PhD and post-doctoral programs of a department with more than 80 professors.

01/01/2023 – 31/12/2023 London, United Kingdom

GUEST EDITOR OF THE INTERNATIONAL PEER REVIEWED JOURNAL "CURRENT OPINION IN SOLID STATE & MATERIALS SCIENCE" (IF 12.2). ELSEVIER

- Editor of a special issue entitled "The next generation of nanoindentation and small-scale mechanical testing" (https://www.sciencedirect.com/special-issue/10L8W92G7GB)

01/01/2023 – CURRENT London, United Kingdom

GUEST EDITOR OF THE INTERNATIONAL PEER REVIEWED JOURNAL "MATERIALS SCIENCE AND ENGINEERING A" (IF 6.1) ELSEVIER

- Guest Editor of a series of Special Issues entitled "Nanomechanical Testing in Materials Research and Development" (https://www.sciencedirect.com/special-issue/10M5F2VFVJ7)

01/01/2019 – 31/12/2019

GUEST EDITOR OF THE INTERNATIONAL PEER REVIEWED JOURNAL "NANOMATERIALS" (IF 4.4) MDPI

- Guest Editor of a Special Issue entitled "Characterization of Nanomaterials" (https://www.mdpi.com/journal/nanomaterials/special_issues/charact_nano)

01/01/2011 – CURRENT Rome, Italy

TEACHING ACTIVITIY AT THE UNIVERSITY OF ROME "ROMA TRE" UNIVERSITÀ DEGLI STUDI ROMA TRE

Lecturer of the university master courses "Advanced Characterisation of Biomaterials" and "Materials Technology for Aeronautics", at "Roma TRE" university

01/02/2014 – 31/07/2014

TEACHING ACTIVITIY AT THE UNIVERSITY OF TENNESSEE KNOXVILLE (USA)

Guest Professor, Department of Materials Science and Engineering (MSE), University of Tennessee – USA

EDUCATION AND TRAINING

26/03/2008 – CURRENT Rome, Italy

PHD IN MECHANICAL AND INDUSTRIAL ENGINEERING Università degli studi Roma Tre

Address via della Vasca Navale 79, 00146, Rome, Italy | **Website** www.stm.uniroma3.it

26/10/2004

MASTER DEGREE IN MATERIALS ENGINEERING (110/110 CUM LAUDE) Università di Roma La Sapienza

Website www.uniroma1.it

01/01/2018 – CURRENT

NATIONAL HABILITATION (ABILITAZIONE SCIENTIFICA NAZIONALE) AS A FULL PROFESSOR IN ITALY

Italian Ministry for research

LANGUAGE SKILLS

Mother tongue(s): **ITALIAN**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	C2	C2	C1	C1	C2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DIGITAL SKILLS

Microsoft Word | Microsoft Excel | Microsoft Office | Microsoft Powerpoint | Outlook | Zoom | Skype | Instagram | Google Docs | Facebook | LinkedIn | Internet user | Power Point | Twitter | Social Media | Written and Verbal skills | Organizational and planning skills | Good listener and communicator | Analytical skills | Team-work oriented | Strategic Planning | Decision-making | Google Drive | Creativity | Conflict resolution | Motivated | WhatsApp | Critical thinking | Gmail | Research and analytical skills | Excellent writing and verbal communication skills | Responsibility | Presenting | Reliability

PROJECTS

31/12/2013 – 30/12/2016

ISTRESS - Pre-standardisation of incremental FIB micro-milling for intrinsic stress evaluation at the sub-micron scale

Intrinsic (or residual) stresses, resulting from manufacturing or processing steps, mostly define the performance and limit the lifetime of nanostructured materials, thin films, coatings and MEMS devices. The established techniques for micron-scale measurement of residual stress still have strong limitations, e.g. in terms of spatial resolution, lack of depth sensing, their applicability on non-crystalline materials or accessibility to industry. In this project, a European consortium is established to develop an innovative, highly reproducible and automated measurement protocol for the analysis of residual stress on a sub-micron scale, based on incremental focused ion beam (FIB) milling, along with high-resolution in situ Scanning Electron Microscopy (SEM) imaging and full field strain analysis by digital image correlation (DIC). The activities focused on the implementation and pre-standardisation of automated FIB-SEM, DIC and inverse stress calculation procedures, under official project liaisons with both CEN and VAMAS, together with the analysis and modelling of FIB induced artefacts and stress-structure-properties relationship for the selected materials and devices. The final aim of the project was the development of innovative design rules, implemented into simulation and optimization tools under coordination of industry partners, for the production of residual stress-controlled nanostructured materials, with specific focus on (i) multi-layered nano-coatings, (ii) micro/nano-crystalline and amorphous materials, (iii) MEMS and 3D metal interconnects. The project has realised a breakthrough in measurement, standardization and modelling ability of the residual stress distribution at the sub-micron scale.

Link https://cordis.europa.eu/project/id/604646

30/11/2017 – 31/03/2022

OYSTER - Open characterisation and modelling environment to drive innovation in advanced nano-architected and bio-inspired hard/soft interfaces

A failure to quantitatively control adhesion costs billions of euros each year in failed components, suboptimal product performance and life-threatening infections. Nano-enabled and bio-inspired products offer practical solutions to overcome adhesion and friction problems in these application areas. Current tools and methodologies, however, have so far failed to produce any standardised interpretation of adhesion data linking nanoscale adhesion to the macroscopic data. OYSTER uses contact mechanics to bridge adhesion data at multiple length scales and link interfacial adhesion to physicochemical properties. OYSTER brings Europe's first-class laboratories and SMEs to take existing nanoscale characterisation technologies towards widespread utilisation in process optimisation and model validation. OYSTER achieves this by sharing metadata in an Open Innovation Environment, where new paradigms of multi-scale contact mechanics are validated on selected application oriented reference materials through continuous interaction with the European Materials Characterisation Council (EMCC). This way, OYSTER generates wider agreement over adhesion measurement protocols by multimodal Atomic Force Microscopy and high-speed nanoindentation.

Link https://cordis.europa.eu/project/id/760827

01/02/2021 – CURRENT

NanoMECommons - Harmonisation of EU-wide nanomechanics protocols and relevant data exchange procedures, across representative cases; standardisation, interoperability, data workflow

EU-funded NanoMECommons will form an EU-wide research and innovation network aiming to develop harmonised and widely accepted characterisation protocols, utilising high-speed nanoindentation (including multi-technique protocols) and focused ion beam. These protocols will be integrated into real industrial environments to boost material, process, and product reliability with reduced measurement discrepancy, improved data interoperability and traceability (TRL 6). NanoMECommons aims to provide a unique and interoperable metadata structure (iCHADA) to enhance data quality and information management. iCHADA will support the establishment of data-driven structure-properties relations to assist the quality assurance and material design procedures in the industry. The goal is the standardisation of testing to contribute directly to Industry Commons and facilitate reusability and transferability of characterisation data across multiple manufacturing sectors.

Link https://cordis.europa.eu/project/id/952869

31/01/2022 – CURRENT

MIRIA - DEVELOPMENT OF ANTIMICROBIAL, ANTIVIRAL, AND ANTIFUNGAL NANOCOATINGS FOR EVERYDAY SURFACES

Since the end of 2019, the spread of COVID has deeply changed our lifestyle, resulting in historical events and decisions, such as the EU block of non-essential travel among countries (COMM (2020) 499), affecting the whole EU society economically and psychologically. In this economical, societal and clinical context, the project MIRIA aims to develop wide-range-antimicrobial nanocoatings to be used in hospitals and other environments where cross-contamination and contagion risk are significant issues. In the wake of the covid outbreak, there has been large concern about infection spread of pathogens (i.e., bacteria, fungi, virus, and specifically SARS-CoV-2) via high traffic surfaces (i.e., medical equipment). State of the art and commercial products coating solutions that both target a range of mixed pathogens and different surfaces (e.g., glass, metal, textile) are unfortunately scant. MIRIA solutions aim to fill this void, impacting on EU health, both directly (by creating public safe environments) and indirectly (by reducing COVID spreading and decreasing ill-related work absences and psychological pathologies). A reduction of the work absence of at least 5% with respect to the 2020 value (15M in EU) is expected. MIRIA main challenging ambition is to develop nanocoatings with a 99.99% effectiveness against a wide range of pathogens, especially SARS-CoV-2. This will be based on a four pieces puzzle: the knowledge in anti-microbial materials, nanopowders, nanocoating and pilot plant conduction. These nanocoatings will be brought to pilot scale (TRL6) and, within 3 years after the end of the project, they are foreseen to enter the market (TRL9). The exploitation of MIRIA outputs deeply involves 3 SMEs and the dissemination plan will follow a spill-over strategy in order to involve public and private stakeholders.

Link Horizon Europe g.a. N. 101058751

31/01/2022 – CURRENT

PRIN - CONCERTO, Multiscale modelling/characterisation and fabrication of nanocomposite ceramics with improved toughness (CONCERTO)

The **CONCERTO project** develops a suite of harmonized multiscale materials modelling and characterization methods, to support and accelerate the production of Ceria-stabilized zirconia (Ce-TZP) nanocomposites and coatings, with **unprecedented combination between strength and toughness**. Within CONCERTO, three strategies to increase crack propagation resistance will be investigated by using integrated modelling/characterization techniques: (i) **phase transformations in front of the crack tip**, (ii) **second phase toughening** and (iii) **grain boundary engineering**. To investigate such mechanisms, advanced micro-nanoscale characterization methods will be developed and validated, in direct comparison with a novel Phase-Field Method (PFM) for Finite Element Modelling of the microstructural effects on crack nucleation and propagation. A **multi-scale design** of selected ceramic components will be performed, to demonstrate the ability to engineer the materials from the nano/microstructural features to the macro-structure, and through all processing ceramic steps, from composite powder elaboration, to shaping and sintering of the final parts. An emerging 3D printing technology for technical ceramics, **stereolithography**, will be used for the first time to fabricate simple and complex-shaped demonstrators, in parallel with the exploitation of thermal spray technology to fabricate coatings. Finally, two impactful case studies are selected to demonstrate the relevance of the research conducted, namely optimization and functional validation of (a) Ce-TZP materials for application in dental prostheses and (b) Ce-TZP composite thermal barrier coatings for high-temperature applications.

Link PRIN2020 project funded N. 2020BN5ZW9

31/03/2022 – CURRENT

COBRAIN - Integrated Computational-Experimental material Engineering of Thermal Spray coatings

Wear and corrosion protection plays a crucial role effort of European Manufacturing Industries to maximise both efficiency and productivity because is inherently related to the lifetime of the components and their manufacturing cost. Thermal Spray technologies for deposition of Hardmetals were developed for this reason, which is to provide higher resistance to sliding and abrasive wear, coupled with good corrosion resistance. In this field innovation is based on experimental trial-and-error and operational feedback because the equations that can model the coating performance have to consider the mechanical properties of the hard phase and those of the metal binder, their microstructure and interaction, their evolution during the non-equilibrium Thermal Spray process. The final coating properties depend on all these factors and more, and they are too many for a physical modelling workflow to provide reliable results on a time scale that is compliant with industrial changes to fluctuating markets, supply chains and regulations. On the other hand, tools based on experimental data that relies only on final coating macro properties require extensive datasets to be reliable, which again conflict with the response time required by industrial innovation. Moreover, innovation in coating technology is not just a matter of performance and costs: industrial companies have to consider multiple other factors such as the impact on workers, hidden regulatory costs, environmental protection costs, and also general public opinion. CoBRAIN offers a solution to this need, exploiting the integration of computational and experimental data through semantic interoperability, and developing an intelligent tool that will be able to propose novel materials from the class of High Entropy Hardmetals for direct deposition by HVOF, HVAF and CGS Thermal Spray, and capable to estimate their impact on the economy and the environment.

31/07/2022 – CURRENT

iENTRANCE@ ENL - Infrastructure for Energy Transition and Circular Economy @ EuroNanoLab

Within the National Recovery and Resilience Plan (NRRP), university of Roma Tre (with coordination of prof. Marco Sebastiani), will act as co-proponent of the research infrastructure “Infrastructure for Energy Transition and Circular Economy @ EuroNanoLab” iENTRANCE@ ENL (PNRR, Missione 4: Istruzione e ricerca, Componente 2: Dalla ricerca all’impresa, Investimento 3.1).

A revolution in materials, processes and systems for energy generation, storage, distribution and use is of fundamental importance for the future of the planet. The project, “Infrastructure for Energy Transition and Circular Economy @ EuroNanoLab” (iENTRANCE@ENL), aims to become the first research infrastructure of European excellence in Italy with the mission to provide the scientific community with access to facilities for: 1. Nanomaterials for energy; 2. Processes and devices for green energy production, storage and management; 3. Micro and nanoscale characterization; 4. Technologies for the realization of devices and systems. It will be structured across 6 geographical nodes, internationally recognised in complementary research domains, but will operate through a Central Hub acting as single-entry point and unique catalogue of all the methods and technologies available within the consortium. In the Design and Implementation phase (M1-M18), the operational and management backbone of the RI will be constructed, and the digital infrastructure, based on FAIR principles, will play a key role. In the Ramp-Up phase (M19-M30), users from academia and industry will have access to the facilities, and new instrumentation will be acquired and commissioned to further enable cutting-edge research. Access policies will take into account Open Science best practices and the pivotal role of excellent science. In-house research,
enabled by the investments, will push technologies beyond the state-of-the-art to provide sustainability after the NGEU project. In the Full Operation phase, continuing for at least 10 years, Italy will have a distributed, integrated and fully interoperable structure to perform clean energy transition research up to TRL 4. Cooperation with other NGEU infrastructures and research innovation programs will ensure Italian competitiveness, autonomy and sovereignty in the field, covering the entire value chain from low to high TRL.

01/01/2024 – CURRENT

DigiCell

Reliability and innovations in current and upcoming battery technology as one core element of Europe’s green industrial transition are highly dependent on the understanding and systematic classification of the complex processes in advanced functional materials structured at the multiscale level.
DigiCell provides a digitally integrated framework that improves reliability and quality in the manufacturing processes of high-performance Lithium-ion batteries (LIB) and beyond Lithium battery technologies through unified and adaptive models capturing the structure-property relationships in these complex energy materials. It is based on a toolset of innovative and state-of-the-art characterisation methods for multiscale materials, interoperable tests, and analytical models supported by and linked through machine learning. With this, the production costs, materials waste, and the CO2 footprint in production lines will be reduced, while in parallel the battery electrochemical performance at the single cell level will be increased. The new measurement tools and multi-scale modelling algorithms lead to a higher characterisation speed (factor of 5) and an improved accuracy in cell tests by an order of magnitude, as will be demonstrated on the lab bench and in pilot lines. DigiCell develops a new holistic approach for open-source algorithms and data standardization strategies; new quality assessments for a healthy, safe, and circular economy. The project readily interfaces and interacts tightly with EMMC.

PUBLICATIONS

Full list of publications, acording to Google Scholar

Here is the full list of publications according to Google Scholar

Google Scholar

Link https://scholar.google.it/citations?user=vlAsTQUAAAAJ&hl=it

Full list of publocations according to ORCID

ORCID

Link https://orcid.org/0000-0002-9574-1578

Full list of publications according to SCOPUS

SCOPUS

Link https://www.scopus.com/authid/detail.uri?authorId=7005846216

Selection of Best Ten Articles 2014-2024

1. 2023 High-speed nanoindentation mapping: A review of recent advances and applications, https://doi.org/10.1016/j.cossms.2023.101107
2. 2022 Biocompatibility and antibacterial properties of TiCu(Ag) thin films produced by physical vapor deposition magnetron sputtering, https://doi.org/10.1016/j.apsusc.2021.151604
3. 2021 Integrated molecular dynamics and experimental approach to characterize low-free-energy perfluoro-decyl-acrylate (PFDA) coated silicon, https://doi.org/10.1016/j.matdes.2021.109902
4. 2021 A novel nanoindentation protocol to characterize surface free energy of superhydrophobic nanopatterned materials, https://doi.org/10.1557/s43578-021-00127-3
5. 2021 Humidity-dependent flaw sensitivity in the crack propagation resistance of 3D-printed nano-ceramics, https://doi.org/10.1016/j.scriptamat.2020.113684
6. 2020 Nano-scale residual stress profiling in thin multilayer films with non-equibiaxial stress state, https://doi.org/10.3390/nano10050853
7. 2018 Nanoscale residual stress depth profiling by Focused Ion Beam milling and eigenstrain analysis, https://doi.org/10.1016/j.matdes.2018.02.044
8. 2016 High-resolution high-speed nanoindentation mapping of cement pastes: Unravelling the effect of microstructure on the mechanical properties of hydrated phases, https://doi.org/10.1016/j.matdes.2016.02.087
9. 2016 Effect of lithiation on micro-scale fracture toughness of $Li_xMn_2O_4$ cathode, https://doi.org/10.1016/j.scriptamat.2016.01.023
10. 2015 Measurement of fracture toughness by nanoindentation methods: recent advances and future challenges, https://doi.org/10.1016/j.cossms.2015.04.003

CONFERENCES AND SEMINARS

Conference organisation experience

Conference organisation:
2024 - General Chair of the **ECI conference on Nanomechanical Testing in Materials Research &Development**,
2013 to 2023 - **Symposium chair** in all editions (2013-2023) of ICMCTF
2017- **Symposium session chair** - TMS 2017
2016 - **Conference co-chair** – SMT30
Invited presentations:
In the last 10 years, the PI has delivered more 70 oral presentations at international and national conferences, including 30 invited or plenary lectures (full list at https://stm.uniroma3.it/sebastiani).

Link https://stm.uniroma3.it/sebastiani

HONOURS AND AWARDS

31/12/2013
FULBRIGHT research scholarship – Fulbright research program

2014 - **Fulbright Research Scholarship**, University of Tennessee, Knoxville (USA) – prof. George M. Pharr

Link http://www.cies.org/grantee/marco-sebastiani

NETWORKS AND MEMBERSHIPS

01/01/2010 – CURRENT
Materials Research Society (MRS)

Active member of MRS.

Link https://www.mrs.org/home/

01/01/2017 – CURRENT
The Minerals, Metals & Materials Society (TMS)

Active member of TMS

Link https://www.tms.org/

01/01/2008 – CURRENT
The American Ceramic Society

Active member of ACERS

Link https://ceramics.org/

01/01/2005 – CURRENT

Associazione Italiana di Ingegneria dei Materiali (AIMAT)

Active member of AIMAT

Link https://www.aimat.net/

01/01/2005 – CURRENT

Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali (INSTM)

Active member of INSTM