

STEFANIA FEDERICI

WORKING INFORMATION

Organization	Chemistry for Technology Lab. Dept. Mechanical & Industrial Engineering University of Brescia
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CURRENT POSITION

University of Brescia

Research Fellow – Ricercatore tempo determinato (A) - SSD CHIM/07 Fondamenti Chimici delle Tecnologie

EDUCATION

University of Brescia, 2012

Ph.D. in Energy, Fluid & Thermal, Manufacturing Systems and Technologies

Dissertation title: *On the thermodynamics of biomolecule surface transformations*

Università Cattolica del Sacro Cuore, 2008

M.Sc. Physics (110/110 *cum laude*)

Thesis: *Analisi e riconoscimento di una popolazione batterica mediante spettroscopia infrarossa*

GRANTS AND AWARDS

PhD Scholarship, 2008-2011

University of Brescia, Chemistry for Technology Laboratory.

CARIPO-UNIBS-MIT Faculty Exchange Program - Massachusetts Institute of Technology – MIT

Visiting Scientist at the Hamad-Schifferli Group (Prof. Kimberly Hamad-Schifferli), Departments of Mechanical and Biological Engineering, Massachusetts Institute of Technology, Cambridge, United States. Oct/Dec 2010.

62nd Lindau Nobel Laureate Meeting

Nomination, qualification through a multi-stage international selection procedure and participation grant. Lindau, Germany, 1/7 July 2012.

Innovation Village Award 2019 – 1st prize

The prize was awarded for the innovative research project: BASALTO – nuovi materiali BASati Su ALginati per la rimozione di particolaTO aerodisperso.

Diploma al Merito della Ricerca 2018

The prize was awarded in the category “Environment” for the research “Physico-chemical characterization of Soldera Case Basse wine integrated with sensory analysis. When Chemistry meets wine” in the framework of the Soldera Case Basse International Young Researchers Award 2018.

Italcementi - Premio Marzotto 2018

The prize was awarded for the project “Particulate Matter”.

Oscar Masi for the Industrial Innovation 2017 award

The prize was awarded for the project: BASALTO: nuovi materiali BASati Su ALginati per la rimozione di particolaTO aerodisperso.

Italiadecide "Amministrazione, Cittadini, Imprese" 2017 award

The prize was awarded for the innovative research and demonstration for the project: BASALTO – nuovi materiali BASati Su ALginati per la rimozione di particolaTO aerodisperso.

RESEARCH INTERESTS

The research activity of Stefania Federici is related to surface- and nanosystems, focusing on physical chemistry of nanostructured materials and surface confined molecules. She has developed characterization methods at the micro- and nanoscale in particular regarding scanning probe microscopy, and vibrational spectroscopy, also applied to environmental persistent micro- and nanopollutants. Her research activities have been focused in the thermodynamics and nanomechanics of the interaction of biological systems confined onto surfaces, explored by means of nanomechanical biosensors, and a broad field of nano-, eco- and biomaterials at the interface between engineering and biology.

RESEARCH PROJECTS

	ROLE
PON "Ricerca e Innovazione 2014 e 2020": SIRIMAP: Sistemi di Rilevamento dell'Inquinamento MARino da Plastiche e successivo recupero-riciclo (ARS01_01183). Coordinatore Scientifico: Distretto Tecnologico Aerospaziale della Campania.	Researcher
DEASPHOR, ERA-MIN2 Joint Call 2017 (2018-2021): Design of a product for substitution of phosphate rocks. Coordinatore scientifico: prof. Bruno Valentim, University of Porto.	Researcher
RENDERING 2018 (Ministero dell'ambiente e della tutela del territorio e del mare): New sustainable composited based on ash derived from municipal wastes and sludges incineration process. Responsabile scientifico: prof. Elza Bontempi.	Researcher
Regione Lombardia – Bando Smart living (2017-2019): Antibacterial Tactile Tool for Innovative Living Areas (A.T.T.I.L.A.). Capofila APPENNINO DI ORI VITTORIO & C. SNC.	Researcher and Work Package leader
Bando UniBS Health and Wealth 2015 - 3DP-4HW: Stampa 3D per la salute ed il benessere dei pazienti in età pediatrica. Responsabile scientifico: prof. Marco Perona	Researcher and Work Package leader
Regione Lombardia – INSTM (2017-2019): Microsfere adattive per il monitoraggio ambientale e l'abbattimento di inquinanti persistenti (MI ADATTI E L'ABBATTI). Coordinatore scientifico Prof. Ivano Alessandri, Università di Brescia	Researcher
Regione Lombardia – INSTM (2017-2019): nuovi materiali BASati Su ALginati per la rimozione di particellaTO aerodisperso (BASALTO). Coordinatore scientifico Prof.ssa Elza Bontempi, Università di Brescia	Researcher
National Institute of Health (2010-2016): Neurologic function in children exposed to ambient manganese. Coordinatore scientifico Prof. Roberto Lucchini, Università di Brescia	Researcher
PRIN 2010-2011 (No. 2010REYFZH): Disordini della regolazione di epidina e dell'omeostasi del ferro: meccanismi, diagnosi e trattamenti innovativi. Coordinatore scientifico Prof. Paolo Arosio, Università di Brescia	Researcher and Work Package leader
Fondazione Cariplo-MIT (2010-2012): Translating Protein Folding into co-operative Nanomechanical Work. (Massachusetts Institute of Technology, Departments of Mechanical and Biological Engineering, oct/dec 2010)	Researcher and Visiting Scientist
Life+ (2010-2012): COSMOS-COLloidal Silica Medium to Obtain Safe inert. Coordinatore scientifico Prof.ssa Elza Bontempi, Università di Brescia.	Researcher
Regione Lombardia – INSTM (2010-2012): Nanomechanical Sensors for Anfetamins (SNAF). Coordinatore scientifico: prof. Paolo Bergese, Università di Brescia.	Researcher
Progetto di Cooperazione Internazionale Italia-India (2009-2011): Monitoring of heavy metals in environmental matrices. Coordinatore scientifico Prof.ssa Elza Bontempi, Università di Brescia.	Researcher
PRIN 2008 (No. JWYX8 2008): Phononic crystals and near field spectroscopy applied o femtosecond time-resolved optical experiments for studying the dynamics of the biomolecular interactions among angiogenic. Responsabile scientifico del progetto, Fulvio Parmigiani, Università di Trieste.	Researcher
FPVII, Capacities: NASPE (2008-2011): NANomechanical Screening of Pharmaceutical Entities www.ing.unibs.it/naspe. Coordinatore scientifico: prof. Paolo Bergese, Università di Brescia.	Researcher

TEACHING EXPERIENCE

S.F. has teaching experience at the University of Brescia, as Teaching Assistant of the course of General Chemistry for engineering students (2009-today), Laboratory of Spectroscopy (2013-today) and Laboratory for Material Analysis (2011-2013). She has tutored B.Sc. and M.Sc. undergraduate students in Biotechnology, Mechanical and Environmental Engineering (3 students). She is co-tutor of 2 PhD student.

THIRD MISSION

S.F. was Member of the Brescia Local Committee for International Year of Chemistry, 2011.

She is co-author of 2 publications on local journals:

1. A. Sottini, S. Mitola, **S. Federici**, P. Bergese, *La nanomeccanica al servizio dei NAS*, Brescia Ricerche, 2012, 77-78.
2. **S. Federici**, G. Oliviero, *Nanomeccanica a supporto della biomedicina*, Brescia Ricerche, 2009, 68-69-70.

She was cited in several local newspapers:

1. Palato e udito, protesi per bambini con stampa 3D e biosilicone riciclato, *Giornale di Brescia*, 27th February 2019.
2. Arriva Attila, lo zerbino che combatte I batteri nelle case e negli ospedali, *Giornale di Brescia*, 30th January 2019.
3. Premiato l'intonaco che intrappola le polveri sottili, *Giornale di Brescia*, 23rd November 2018.
4. Stampa 3D per ridurre l'inquinamento. Il sole 24 ore, 29th January 2018.
5. Nuove droghe, Brescia mette a punto il test per catalogarne i danni e i rischi, *Corriere della Sera, Cronache di Brescia*, 27th June 2014.
6. Statale. Le nanotecnologie diventano sempre più grandi, 26th January 2011.

She actively collaborates with Smart Solutions s.r.l., spin-off of the University of Brescia. Thanks to this collaboration she is also co-inventor of a patent "Metodo per la simulazione del colore di un substrato solido rivestito superficialmente con un film e di applicazione di tale film tramite deposizione di strati atomici" (*status pending*).

PEER-REVIEWED PUBLICATIONS AND INTERNATIONAL ACTIVITIES

S.F. is author and co-author of 28 papers on peer reviewed journals. She is co-author of 1 book chapter.

She serves as reviewer for *The European Physical Journal E*, *Biosensors and Bioelectronics Open Access*, *Biosensors (MDPI)*, *Colloids and Interfaces (MDPI)*, *Polymers (MDPI)*, *Frontiers in Chemistry*, *Journal of Colloid and Interface Science*, *Nanomaterials (MDPI)*.

She has contributed to more than 25 poster and oral presentation in national and international meetings, 4 of them as oral speaker.

She was member of the Scientific Committee of the International Summer School on "Materials for Industry", 18-22 September 2017, Brescia (Italy) and member of the Local Organizing Committee of the 17th International Conference on Total Reflection X-Ray Fluorescence Analysis and Related Methods (TXRF 2017), 19-22 September, 2017, Brescia (Italy).

She is member of the Scientific Advisory Board of the International Summer School on "Vibrational Spectroscopy", to be held in Brescia on 9-13 September 2019. She is also member of the Local Organizing Committee of the International Conference on Emerging Trends in Vibrational Spectroscopy (VISPEC 2019) to be held in Brescia on 11-13 September 2019.

Scopus *h index* 10, *total citations* 324 (ID: 35181237500).

Google scholar *h index* 12, *total citations* 406.

PEER-REVIEWED PUBLICATIONS LIST

2019

1. F. Bilo, L. Borgese, G. Pardini, E. Marguá, A. Zacco, R. Dalipi, **S. Federici**, M. Bettinelli, M. Volante, E. Bontempi, L. E. Depero, *Evaluation of different quantification modes for a simple and reliable determination of Pb, Zn and Cd in soil suspensions by total reflection X-ray fluorescence spectrometry*, *Journal of Analytical Atomic Spectrometry*, 2019 (doi: 10.1039/c9ja00040b).
2. J. L. Ruiz, J. D. Hutcheson, L. Cardoso, T. Pham, S. Busatto, **S. Federici**, A. Ridolfi, P. Bergese, S. Weinbaum, E. Aikawa, *Nanoanalytical Analysis of Bisphosphonate-Induced Alterations of Microcalcifications using a 3D Hydrogel Platform*, *PNAS*, 2019, submitted.
3. A. Zanoletti, F. Bilo, **S. Federici**, L. Borgese, L.E. Depero, J. Ponti, A. Valsesia, R. La Spina, R.B. Capomaccio, T. Montini, E. Bontempi, *The first material-based solution able to sequester fine and ultrafine air particulate matter*, *Journal of Hazardous Material*, 2019, submitted.
4. L. Borgese, F. Kasemi, A. Assi, M. Chiesa, G. Gerosa, D. Zappa, E. Comini, C. Carnevale, M. Volta, D. Placidi, R. Lucchini, **S. Federici**, E. Bontempi, L. Depero, *Critical evaluation of aerosol sampling using optical and gravimetric devices in comparison with a cascade impactor*, *Aerosol Science & Technology*, 2019, submitted.
5. I. Vassalini, N. Bontempi, **S. Federici**, M. Ferroni, A. Gianoncelli, I. Alessandri, *Nanocomposite Hydrogels for Pan-Specific Capture and Ultrasensitive Raman Detection of Persistent Organic Pollutants*, *Nature Nanotechnology*, 2019, submitted.
6. L. Paolini*, **S. Federici***, G. Consoli, A. Radeghieri, I. Alessandri, P. Bergese, *Collective fingerprint of extracellular vesicles of different sizes and cellular origin by FT-IR spectroscopy*, *Analytical Chemistry*, 2019, in preparation. *equally contribution
7. L. Borgese, F. Bilo, A. Zacco, **S. Federici**, E. Bontempi, K. Trzepla, P. Wobrauschek, and L. E. Depero, *Development of the analytical method for quantitative analysis of Pb in air particulate matter by grazing incidence X-Ray Fluorescence using novel reference materials*, 2019, in preparation.
8. **S. Federici**, L. Borgese, F. Bilo, A. Zacco, A. Riboldi, N. Bontempi, E. Bontempi, M. Pasquali, P. Wobrauschek, L.E. Depero, *On the mechanisms of species release from ALD coated surfaces*, *J Solid State Science Tech*, in preparation.

2018

9. M. Pasquali, A. Zanoletti, L. Benassi, **S. Federici**, L. E. Depero, E. Bontempi, *Stabilized biomass ash as a sustainable substitute for commercial P-fertilizers*, *Land Degradation & Development*, 2018 (doi: 10.1002/ldr.2915).
10. A. Zanoletti, I. Vassura, E. Venturini, M. Monai, T. Montini, **S. Federici**, A. Zacco, L. Treccani, E. Bontempi, *A new porous hybrid material derived from silica fume and alginate for sustainable pollutants*, *Frontiers in Chemistry*, 2018 (doi: 10.3389/fchem.2018.00060).
11. **S. Federici**, A. Ridolfi, A. Zandrini, A. Radeghieri, E. Bontempi, L.E. Depero, P. Bergese, *Interaction of extracellular vesicles with Si surface studied by nanomechanical microcantilever sensors*, *Applied Sciences*, 2018 (doi:10.3390/app8030404).
12. F. Bilo, L. Borgese, A. Wambui, A. Assi, A. Zacco, **S. Federici**, D. M. Eichert, K. Tsuji, R. G. Lucchini, D. Placidi, E. Bontempi, L. E. Depero, *Comparison of multiple X-ray fluorescence techniques for elemental analysis of particulate matter collected on air filters*, *Journal of Aerosol Science*, 2018 (doi: 10.1016/j.jaerosci.2018.05.003).
13. F. Bilo, S. Pandini, L. Sartore, L. E. Depero, G. Gargiulo, A. Bonassi, **S. Federici**, E. Bontempi, *A sustainable bioplastic obtained from rice straw*, *Journal of Cleaner Production*, 2018 (doi: 10.1016/j.jclepro.2018.07.252).

2017

14. F. Bilo, R. Dalipi, A. Zacco, **S. Federici**, M. Masperi, P. Leonesio, E. Bontempi, L.E. Depero, *Elemental analysis of tree leaves by total reflection X-ray fluorescence: new approaches for air quality monitoring*, Chemosphere, 2017 (doi: 10.1016/j.chemosphere.2017.03.090).
15. A. Zanoletti, **S. Federici**, L. Borgese, P. Bergese, M. Ferroni, L. E. Depero, E. Bontempi, *Embodied energy as key parameter for sustainable materials selection: the case of reusing coal fly ash for removing anionic surfactants*, Journal of Cleaner Production, 2017 (doi: 10.1016/j.jclepro.2016.09.070).
16. L. Borgese, R. Dalipi, A. Riboldi, F. Bilo, **S. Federici**, A. Zacco, M. Bettinelli, E. Bontempi, L.E. Depero, *Comprehensive approach to the validation of the standard method for total reflection X-ray fluorescence analysis of water*, Talanta, 2017 (doi: 10.1016/j.talanta.2017.12.087).

2016

17. **S. Federici**, F. Padovani, M. Poli, F. Carmona Rodriguez, P. Arosio, L. E. Depero, P. Bergese, *Energetics of surface confined ferritin during iron loading*, Colloids and Surface B: Biointerfaces, 2016, (doi: 10.1016/j.colsurfb.2016.05.044).
18. L. Borgese, F. Bilo, A. Zacco, E. Bontempi, M. Pasquali, **S. Federici**, J. Prost, M. Rauwolf, A. Turyanskaya, C. Strelti, P. Kregsamer, P. Wobraschek, L. E. Depero, *ALD to prevent metal transfer from implants*, ECS Transactions, 2016 (doi: 10.1149/07506.0167ecst).

2015

19. F. Bilo, S. Moscozo, L. Borgese, M. V. Delbarba, A. Zacco, A. Bosio, **S. Federici**, M. Guarienti, M. Presta, E. Bontempi, L. E. Depero, *Total Reflection X-Ray Fluorescence spectroscopy to study Pb and Zn accumulation in zebrafish embryos*, X-RAY Spectrometry, 2015 (doi: 10.1002/xrs.2588).
20. A. Aronne, F. Bloisi, R. Calabria, V. Califano, L.E. Depero, E. Fanelli, **S. Federici**, P. Massoli, L.R.M. Vicari, *Lipase biofilm deposited by Matrix Assisted Pulsed Laser Evaporation technique*. Applied Surface Science, 2015 (doi: 10.1016/j.apsusc.2014.11.008).

2014

21. E. Biavardi*, **S. Federici***, C. Tudisco, D. Menozzi, C. Massera, A. Sottini, G. G. Condorelli, P. Bergese, E. Dalcanale, *Cavitation-Grafted Silicon Microcantilevers as a Universal Probe for Illicit and Designer Drugs in Water*, Angewandte Chemie International Edition, 2014 (doi: 10.1002/ange.201404774). *equally contributed. **HOT PAPER**
22. V. Califano, F. Bloisi, A. Aronne, **S. Federici**, L. Nasti, L. E. Depero, L. R. M. Vicari, *Biosensor Applications of MAPLE Deposited Lipase*, Biosensors, 2014 (doi: 10.3390/bios4040329).

2013

23. L. Borgese, **S. Federici**, A. Zacco, A. Gianoncelli, L. Rizzo, D. R. Smith, F. Donna, R. Lucchini, L.E. Depero, E. Bontempi, *Metal fractionation in soils and assessment of environmental contamination in the Vallecarnonica, Italy*, Environmental Science and Pollution Research, 2013 (doi: 10.1007/s11356-013-1473-8).
24. D. Maiolo*, **S. Federici***, L. Ravelli, L.E. Depero, K. Hamad-Schifferli, P. Bergese, *Nanomechanics of surface DNA switches probed by captive contact angle*, JCIS, 2013 (doi: 10.1016/j.jcis.2013.03.069). *equally contributed.
25. P. Colombi, P. Bergese, E. Bontempi, L. Borgese, **S. Federici**, S.S. Keller, A. Boisen, L.E. Depero, *Sensitive determination of the young's modulus of thin films by polymeric microcantilevers*, Meas. Sci. Technol., 2013 (doi: 10.1088/0957-0233/24/12/125603).
26. G. Oliviero, M. Chiari, E. De Lorenzi, R. Colombo, M. Cretich, F. Damin, **S. Federici**, L.E. Depero, P. Bergese, *Leveraging on nanomechanical sensors to single out active small ligands for β 2-microglobulin*, Sens. Actuators B: Chem., 2013 (doi:10.1016/j.snb.2012.09.032).

2012

27. S.K. Hazra, L. Borgese, **S. Federici**, E. Bontempi, M. Ferrari, V. Ferrari, J.R. Plaisier, X. Santarelli, G. Zerausck, A. Lausi, L.E. Depero, *Electrical resistivity of Ti-Zn mixed oxides thin films deposited by Atomic Layer Deposition*, Thin Solid Films, 2012 (doi: 10.1016/j.tsf.2012.03.131).
28. **S. Federici**, G. Oliviero, D. Maiolo, L.E. Depero, I. Colombo, P. Bergese, *On the thermodynamics of biomolecule surface transformations*, Journal of Colloid and Interface Science, 2012 (doi: 10.1016/j.jcis.2012.02.013).
29. M. Dionisio, G. Oliviero, D. Menozzi, **S. Federici**, R.M. Yebeutchou, F.P. Schmidtchen, E. Dalcanale, and P. Bergese, *Nanomechanical Recognition of N-Methylammonium Salts*, JACS, 2012 (doi: 10.1021/ja210567k).

2011

30. F. Torricelli, J.R. Meijboom, E.C.P. Smits, A.K. Tripathi, M. Ferroni, **S. Federici**, G.H. Gelinck, L. Colalongo, Z.M. Kov'acs-Vajna, D.M. de Leeuw, and E. Cantatore, *Transport Physics and Device Modeling of Zinc Oxide Thin Film Transistors - Part I: Long Channel Devices*, IEEE Transactions On Electron Devices, 2011 (doi: 10.1109/TED.2011.2155910).
31. H. de Puig Guixé*, **S. Federici***, S.H. Baxamusa, P. Bergese, and K. Hamad-Schifferli, *Quantifying the nanomachinery of the nanoparticle-biomolecule interface*, Small, 2011 (doi: 10.1002/sml.201100530). *equally contributed.

2010

32. G. Oliviero, **S. Federici**, P. Colombi, P. Bergese, *On the difference of equilibrium constants of DNA hybridization in bulk solution and at the solid-solution interface*. Journal of Molecular Recognition, 2010 (doi:10.1002/jmr.1019).
33. G. Oliviero, D. Maiolo, D. Leali, **S. Federici**, L.E. Depero, M. Presta, S. Mitola, P. Bergese, *Nanoliter contact angle probes tumor angiogenic ligand-receptor protein interactions*. Biosensors & Bioelectronics, 2010 (doi: 10.1016/j.bios.2010.07.115).
34. **S. Federici**, G. Oliviero, K. Hamad-Schifferli, P. Bergese, *Protein thin film machines*, Nanoscale, 2010 (doi: 10.1039/C0NR00616E).

2009

35. P. Colombi, P. Bergese, **S. Federici**, I. Alessandri, L.E. Depero, *Self-assembled polystyrene nano-spheres for the evaluation of AFM-tip curvature radius*. Measurement Science and Technology, 2009 (doi: 10.1088/0957-0233/20/8/084015).

CONGRESS ABSTRACTS

1. P. Ruzzenenti, A. Denardo, F. Carmona, **S. Federici**, M. Asperti, P. Bergese, M. Poli, P. Arosio, *Heparin binding domains in BMP6: Study on the synthetic peptides and the recombinant protein*, American Journal of Hematology, 2017, 92 (8), E410-E410, Meeting Abstract: 169. Seventh Congress of the International Biolron Society (IBIS) Biennial World Meeting (Biolron 2017) (doi: 10.1002/ajh.24812).
2. **S. Federici**, N. Bontempi, I. Vassalini, M. Litvinava, J. Gjipalaj, I. Alessandri, *Magic spheres for biosphere: capture, monitoring and removal of persistent pollutants*, Journal of Applied Biomaterials & Functional Materials, 2017, vol. 15, 4: pp. e387-e422. XIV Aimat National Congress July 12-15, 2017 – Ischia, Italy (doi: 10.5301/jabfm.5000369).

BOOK CHAPTER

1. Paolo Bergese and **Stefania Federici** (2017). Surface Nanomechanics of Biomolecules and Supramolecular Systems, Nanomechanics, Prof. Alexander Vakhrushev (Ed.), InTech, DOI: 10.5772/intechopen.68293.