

PERSONAL INFORMATION

Francesca Petronella



Institute of Crystallography (IC) of National Research Council (CNR), Montelibretti Division

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Sex F | Date of birth 16/02/1981 | Nationality Italian

Enterprise	University	EPR
<input type="checkbox"/> Management Level	<input type="checkbox"/> Full professor	<input type="checkbox"/> Research Director and 1st level Technologist / First Researcher and 2nd level Technologist / Principal Investigator
<input type="checkbox"/> Mid-Management Level	<input type="checkbox"/> Associate Professor	<input checked="" type="checkbox"/> Level III Researcher and Technologist
<input type="checkbox"/> Employee / worker level	<input type="checkbox"/> Researcher and Technologist of IV, V, VI and VII level / Technical collaborator	<input type="checkbox"/> Researcher and Technologist of IV, V, VI and VII level / Technical collaborator

WORK EXPERIENCE

30/09/2019 - now

Researcher

Institute of Crystallography (IC) of National Research Council (CNR), Montelibretti Division, Area della Ricerca Roma 1 Via Salaria Km 29,300 00015 Monterotondo – RM (IT)

<http://www.ic.cnr.it>

- Immobilization of plasmonic nanoparticles on substrates,
- spectroscopic and photothermal characterization of nanoparticle-functionalized substrates, functionalization of nanoparticle-based platforms with bioreceptors,
- investigation of sensing and biosensing properties,
- fabrication and characterization of colloidal metasurfaces for biosensing applications,
- synthesis and functionalization of colloidal plasmonic nanoparticles

Fundamental scientific research (public research)

15/07/2019-15/09/2019

Scholarship

National Interuniversity Consortium of Materials Science and Technology and Via Giusti, 9 50121 Firenze (FI) and Department of Chemistry, Bari University "Aldo Moro", Via Orabona 4, 70126, Bari (BA); Scientific Supervisor Prof. M. Lucia Curri

- Scalable synthesis study of titanium oxide nanocrystals using sol-gel approaches for photocatalytic applications in the environmental field

Fundamental scientific research (public research)

01/04/2018-31/03/2019

Scholarship

Institute of Institute of Chemical and Physical Processes (IPCF) of National Research Council (CNR), Bari Division, at Department of Chemistry, Bari University "Aldo Moro", Via Orabona 4, 70126, Bari (BA); Scientific Supervisor Prof. M. Lucia Curri

- Synthesis and characterization of smart nanostructured materials for the environment and cultural heritage protection

Fundamental scientific research (public research)

01/02/2017 - 31/01/2018

Scholarship

Institute of Institute of Chemical and Physical Processes (IPCF) of National Research Council (CNR), Bari Division, at Department of Chemistry, Bari University "Aldo Moro", Via Orabona 4, 70126, Bari (BA); Scientific Supervisor Dr. Chiara Ingresso

- 01/03/2013 - 28/02/2016

 - Photocatalytic study on nanocomposite materials based on semiconductor nanoparticles for sensing applications

Fundamental scientific research (public research)

Scholarship
 Institute of Institute of Chemical and Physical Processes (IPCF) of National Research Council (CNR), Bari Division, at Department of Chemistry, Bari University "Aldo Moro", Via Orabona 4, 70126, Bari (BA) Scientific Supervisor Dr. Roberto Comparelli

 - Photocatalytic study of nanocomposite materials based on nanoparticles for environmental application

Fundamental Scientific Research (public research)

- 01/01/2010 -31/12/2012

Ph.D Training
 Department of Chemistry, Bari University "Aldo Moro", Via Orabona 4, 70126, Bari (BA); Scientific Supervisor Prof. Angela Agostiano

 - Nanocrystal-based heterostructures and nanocomposite for photocatalysis

Fundamental Scientific Research and education (public research)

- 01/07/2012 -31/10/2012

Visiting Student
 Advanced Oxidation Processes Group (GPAO), École Polytechnique Fédérale de Lausanne; Scientific Supervisors Prof. J. Kiwi and Prof. C. Pulgarin

Characterization and self-disinfecting activity of metal oxide nanoparticles sputtered onto polyester textile

Fundamental Scientific Research and education (public research)

- 01/11/2009 - 01/01/2010

Scholarship
 Institute of Institute of Chemical and Physical Processes (IPCF) of National Research Council (CNR), Bari Division, at Department of Chemistry, Bari University "Aldo Moro", Via Orabona 4, 70126, Bari (BA); Scientific Supervisor Dr. Roberto Comparelli

 - Characterization of the photocatalytic properties of nanostructured catalysts deposited on substrates

Fundamental Scientific Research (public research)

EDUCATION AND TRAINING

01-01-2010-16-04-2013

Ph.D. Title in Chemistry of Innovative Materials

EQF 8

Department of Chemistry, Bari University "Aldo Moro", Via Orabona 4, 70126, Bari (BA); Scientific Supervisor

- Synthesis of nanoparticles and nanocomposites, by "hot injection" methods, and photochemical methods.
- Surface functionalization of by chemistry exchange procedures
- Nanoparticle characterization techniques (UV-Vis absorption spectroscopy, Reflectance spectroscopy, Photoluminescence spectroscopy, AT-IR Spectroscopy, XPS Spectroscopy)
- Morphologic techniques (SEM/EDS, AFM, Optical Microscope, TEM, Profilometry);
- Regulation En 15802, 2010 For The Determination Of Static Contact Angle Of Surfaces;
- Testing the photocatalytic activity of materials, nanomaterials surfaces, and coatings (ISO standard 10678:2010);
- Plasmachemical method for the treatment of Surfaces: Direct Current Magnetron Sputtering and Direct Current Pulsed Magnetron Sputtering
- Preparation of nanocomposite-based coatings and immobilization on conventional and unconventional substrates (casting, spin-coating, dip-coating, spray-coating)
- Test of bactericidal activity of nanomaterials and nanocomposites by E. Coli inactivation experiments (ISO 10705- 2:2000 for the detection and enumeration of bacteriophages).
- Air free techniques: use of the Schlenk line and the Glove box

2000-2008

Master Degree in Chemistry

EQF 7

Department of Chemistry, Bari University "Aldo Moro", Via Orabona 4, 70126, Bari (BA); Scientific Supervisor Prof. Angela Agostiano. Research project: "Nanocrystal composite based catalysts for degradation of organic molecules"

- Synthesis of nanoparticles and nanocomposites, by "hot injection" methods, and
- photochemical methods.
- Nanoparticle characterization techniques (UV-Vis absorption spectroscopy, Reflectance spectroscopy,
- Air free techniques: use of the Schlenk line and the Glove box

WORK ACTIVITIES

Awards

Best Oral presentation award, at Italian Physical Society congress, 2018, section: Applied physics, accelerators, and cultural heritage Photoactive semiconductor nanocrystals for surface protection of architectural stone

Scholarship "Sara Diomede" as the Best Doctoral Thesis in 2013, at School in Chemical and Molecular sciences, University of Bari

Editorial activity

Reviewer for the journals: Chemical Engineering Journal, Applied Catalysis B: Environmental Chemosphere, Analytica Chimica Acta (Elsevier); Environmental Science and Pollution Research (Speinger); Environmental Science: Nano (Royal Society of Chemistry);

Guest editor for the special issues:

Nanomaterials in Photo (Electro) Catalysis, Catalysts, MDPI;

- https://www.mdpi.com/journal/catalysts/special_issues/NPE_catalysts

Catalysts in Bacterial Inactivation and Environmental Cleaning, Catalysts MDPI

- https://www.mdpi.com/journal/catalysts/special_issues/bacte_environ_catalysts

Invited presentations

16-September-2020 "Nanomateriali e nanotecnologie, corso di aggiornamento professionale" o Nanoinnovation 2020, Roma, Facoltà di Ingegneria "Nanomateriali e nanotecnologie in architettura e in edilizia

4 October 2018 at Institute of Fundamental Technological Research Polish Academy of Sciences", Varsavia, Republic of Poland, "Smart nanomaterials: a new route towards novel environmental and biological applications"

PERSONAL SKILLS

Mother tongue(s) Italian

Other language(s) ENGLISH, CAMBRIDGE ENGLISH FIRST (FCE2 O B2 FIRST)
MARCH, REFERENCE NUMBER: 183IT3450008

Job-related skills

- Synthesis plasmonic nanoparticles
- Immobilization of nanoparticles by Layer-by-Layer assembly
- Fabrication of colloidal metasurfaces for sensing applications
- Use of high resolution thermal camera for evaluation of photothermal behaviour of nanomaterials

Digital skills Advanced level skills in Microsoft Office Suite, Origin 2020 and Image J software for analysis of microscopy images,

- Other skills
- Co-supervisor of MSc at Sapienza and Bari Universities
 - Scientific responsible for CNR IC of the scientific agreement between the Montelibretti division of CNR-IC and the Department of Medical-Surgical Science and Biotechnologies, Sapienza University of Rome, Protocol number 0000066/2021, 18/01/2021

ADDITIONAL INFORMATION

Statement of Research Interests

The research activity aims at developing new multifunctional plasmonic platform (rigid or flexible substrates), based on nanoparticle assembly, able to exploit the Localized Surface Plasmon Resonance phenomenon for the qualitative and quantitative detection of pathogens and biomarkers. The plasmonic platforms are conceived as versatile and label-free optical devices for "point of care" and "point of sampling" analysis in water and in biological fluids.

The research interests include investigating chemical and physical approaches for the nanopatform bio-functionalization and incorporating suitable microfluidics circuits to achieve multiple and near-field analyses both for environmental and health-related applications. The investigated devices can provide valuable support also for monitoring the circulation of emerging diseases. The research also explores the nanopatforms' photothermal-induced self-disinfecting ability to prevent the release of pathogens and antimicrobial resistance genes in the environment.

Publications

total number of publications in peer-review journals: 32

total Impact Factor (IF) (average IF/paper): 9.83

total number of citations:739

H index (Scopus):15

List of publications

Francesca Petronella, Daniela De Biase, Federica Zaccagnini, Vanessa Verrina, Seok-In Lim, Kwang-Un Jeong, Selenia Miglietta, Vincenzo Petrozza, Viviana Scognamiglio, Nicholas P. Godman, Dean R. Evans, Michael McConney, Luciano De Sio, Label-free and reusable antibody-functionalized gold nanorod arrays for the rapid detection of Escherichia coli cells in a water dispersion Environmental Science: Nano (IF9.473), Pub Date : 2022-08-12, DOI: 10.1039/d2en00564f

Fanizza, E.; Mastrogiacomo, R.; Pugliese, O.; Guglielmelli, A.; De Sio, L.; Castaldo, R.; Scavo, M.P.; Giancaspro, M.; Rizzi, F.; Gentile, G.; Vischio, F.; Carrieri, L.; De Pasquale, I.; Mandriota, G.; Petronella, F.; Ingrosso, C.; Lavorgna, M.; Comparelli, R.; Striccoli, M.; Curri, M.L.; Depalo, N. NIR-Absorbing Mesoporous Silica-Coated Copper Sulphide Nanostructures for Light-to-Thermal Energy Conversion. *Nanomaterials* 2022, 12, 2545.

Ziai, Y., Petronella, F., Rinoldi, C., Nakielski, P., Zakrzewska, A., Kowalewski, T. A., & Pierini, F. (2022). Chameleon-inspired multifunctional plasmonic nanopatforms for biosensing applications. *NPG Asia Materials*, 14(1), 1-17.

Petronella, F., Antonacci, A., & Scognamiglio, V. Nanoparticles in Biosensor Design for the Agrifood Sector. *Inorganic Nanopesticides and Nanofertilizers: A View from the Mechanisms of Action to Field Applications*, 213. (Book chapter)

Massimo Dell'Edera, Chiara Lo Porto, Ilaria De Pasquale, Francesca Petronella, M. Lucia Curri, Angela Agostiano, Roberto Comparelli, Photocatalytic TiO₂-based coatings for environmental applications ,*Catalysis Today*,Volume 380,2021,Pages 62-83,

Rinoldi, C., Zargarian, S. S., Nakielski, P., Li, X., Liguori, A., Petronella, F., Presutti, D., Wang, Q., Costantini, M., De, L., Gualandi, C., Ding, B., Pierini, F., Nanotechnology-Assisted RNA Delivery: From Nucleic Acid Therapeutics to COVID-19 Vaccines. *Small Methods* 2021, 5, 2100402.

Petronella, F., De Angelis, M., Debiase, D., Lim, S.-I., Jeong, K.-U., Godman, N., Evans, D., McConney, M., De Sio, L. Nanotechnology-based Biosensor for the Detection of Harmful Pathogens in Potable Water 2021 IEEE International Workshop on Metrology for AeroSpace, MetroAeroSpace 2021 - Proceedings, art. no. 9511707, pp. 469-472. (Conference Paper)

I.De Pasquale, C. Loporto, M. Dell'Edera, F. Petronella, A. Agostiano, M.L. Curri, L. Comparelli "Photocatalytic TiO₂-based nanostructured materials for microbial inactivation" *Catalyst* Volume 10, Issue 12, December 2020, Article number 1382, Pages 1-46

De Sio, Luciano; Ding, Bin; Focsan, Monica; Kogermann, Karin; Pascoal-Faria, Paula; Petronella Francesca; Mitchell, Geoffrey; Zussman, Eyal; Pierini, Filippo "Personalized Reusable Face Masks

with Smart Nano-Assisted Destruction of Pathogens for COVID-19: A Visionary Road" *Chem. Eur. J.* 2021, 27, 6112.

Massimo Dell'Edera, Francesca Petronella, Alessandra Truppi, Leonarda Francesca Liotta, Nunzio Galli, Teresa Sibillano, Cinzia Giannini, Rosaria Brescia, Francesco Milano, Marinella Striccoli, Angela Agostiano, Maria Lucia Curri and Roberto Comparelli "Low Temperature Synthesis of Photocatalytic Mesoporous TiO₂ Nanomaterials", *Catalysts*, 10(8), 893, 2020

De Angelis, B, Depalo, N., Petronella, F., Quintarelli, C., Curri, M.L., Pani, R., Calogero, A., Locatelli, F. De Sio, L. "Stimuli-responsive nanoparticle-assisted immunotherapy: A new weapon against solid tumours" (Review) *Journal of Materials Chemistry B* Volume 8, Issue 9, 7 March 2020, Pages 1823-1840

Petronella, F. Truppi, A. Dell'Edera, M., Agostiano, A. Curri, M.L. Comparelli, R. "Scalable synthesis of mesoporous TiO₂ for environmental photocatalytic applications" *MaterialsOpen Access* Volume 12, Issue 11, 1 June 2019, Article number 1853

F. Petronella "Photoactive semiconductor nanocrystals for surface protection of architectural stone" DOI: 10.1393/ncc/i2019-19236-1 *Il Nuovo Cimento C* Published online 20 January 2020 Article: 236

Ferdinanda Annesi, Alfredo Pane Maria Adele Losso, Alexa Guglielmelli, Fabrizio Lucente, Francesca Petronella, Tiziana Placido Roberto Comparelli, Maria Grazia Guzzo, Maria Lucia Curri, Roberto Bartolino and Luciano De Sio "Thermo-Plasmonic Killing of Escherichia coli TG1 Bacteria", *Materials*, Volume 12(9), May 2019, Pages 1530-1542

A. Truppi, F. Petronella, T. Placido, V. Margiotta, G. Lasorella, L. Giotta, C. Giannini, T. Sibillano, S. Murgolo, G. Mascolo, A. Agostiano, M.L. Curri, R. Comparelli "Gram-scale synthesis of UV-vis light active plasmonic photocatalytic nanocomposite based on TiO₂/Au nanorods for degradation of pollutants in water" *Applied Catalysis B: Environmental* Volume 243, April 2019, Pages 604-613.

Francesca Petronella, Antonella Pagliarulo, Alessandra Truppi, Mariateresa Lettieri, Maurizio Masieri, Angela Calia, M. Lucia Curri and Roberto Comparelli "TiO₂ Nanocrystal Based Coatings for the Protection of Architectural Stone: The Effect of Solvents in the Spray-Coating Application for a Self-Cleaning Surfaces" *Coatings* 2018, 8(10), 356;

Esposito Corcione C.; Ingrosso C.; Petronella F.; Comparelli R.; Striccoli M.; Agostiano A.; Frigione M.; Curri M.L. "A designed UV-Vis light curable coating nanocomposite based on colloidal TiO₂ NRs in a hybrid resin for stone protection" *Progress in Organic Coatings*, 122, pp. 290-301, 2018

Truppi, A.; Luna, M.; Petronella, F.; Falcicchio, A.; Giannini, C.; Comparelli, R.; Mosquera, M.J "Photocatalytic Activity of TiO₂/AuNRs-SiO₂ Nanocomposites Applied to Building Materials" *Coatings* 2018, 8, 296.

Caterina Fusco, Michele Casello, Lucia Catucci, Roberto Comparelli, Pietro Cotugno, Aurelia Falcicchio, Francesco Fracassi, Valerio Margiotta, Anna Moliterni, Francesca Petronella, Lucia D'Accolti, and Angelo Nacci "TiO₂@PEI-Grafted-MWCNTs Hybrids Nanocomposites Catalysts for CO₂ Photoreduction" *Materials*, 11, 307, 2018-doi:10.3390/ma11020307, 2018;

Chiara Ingrosso, Giuseppe V. Bianco, Valentina Pifferi, Francesca Petronella, Roberto Comparelli, Marinella Striccoli, Iaria Palchetti, Luigi Falciola, M. Lucia Curri, and Gianni Bruno, "Enhanced photoactivity and conductivity in transparent TiO₂ nanocrystals/graphene hybrid anodes" *Journal of Material Chemistry A*, 5, 9307-9315, 2017

Alessandra Truppi, Francesca Petronella, Tiziana Placido, Marinella Striccoli, Angela Agostiano, Maria Lucia Curri and Roberto Comparelli "Visible-Light-Active TiO₂-Based Hybrid Nanocatalysts for Environmental Applications" *Catalysts*, 7(4), 100-133, 2017;

Francesca Petronella, Antonella Pagliarulo, Marinella Striccoli, Angela Calia, Maria Teresa Lettieri, Donato Colangiuli, M. Lucia Curri, Roberto Comparelli "Colloidal nanocrystalline semiconductor materials as photocatalysts for environmental protection of architectural stone", *Crystals*, 7, 2017

F. Petronella, A. Truppi, T. Sibillano, C. Giannini, M. Striccoli, R. Comparelli, M. L. Curri "Multifunctional TiO₂/FexOy/Ag based nanocrystalline heterostructures for photocatalytic degradation of a recalcitrant pollutant" *Catalysis Today* 284, pp. 100-106, 2016

F. Petronella, A. Truppi, C. Ingrosso, T. Placido, M. Striccoli, M.L. Curri, A. Agostiano, R. Comparelli "Nanocomposite materials for photocatalytic degradation of pollutants" *Catalysis Today*, 281, 85-100,

2017.

L. Cano, A. E. Di Mauro, F. Petronella, E. Fanizza, M. Striccoli, M. Lucia Curri, Agnieszka Tercjak "Effect of Iron Oxide Nanocrystal Content on the Morphology and Magnetic Properties of Polystyrene-block-polymethyl methacrylate Diblock Copolymer Based Nanocomposites" *The Journal of Physical Chemistry C*, 119, 6435-6445, 2015

F. Petronella, M. L. Curri, M. Striccoli, E. Fanizza, C. Mateo-Mateo, R. A. Alvarez-Puebla, T. Sibillano, C. Giannini, M. A. Correa-Duarte, R. Comparelli "Direct growth of shape controlled TiO₂ nanocrystals onto SWCNTs for highly active photocatalytic materials in the visible" *Applied Catalysis B, Environmental*, 178, 91-99, 2015

S. Murgolo, F. Petronella, R. Ciannarella, R. Comparelli, A. Agostiano, M.L. Curri, G. Mascolo "UV and solar-based photocatalytic degradation of organic pollutants by nano-sized TiO₂ grown on carbon nanotubes" *Catalysis Today* 240, : 114-124 2015

F. Petronella, S. Rtimi, R. Comparelli, R. Sanjines, C. Pulgarin, M. L. Curri, John Kiwi "Uniform TiO₂/In₂O₃ surface films effective in bacterial inactivation under visible light" *Journal of Photochemistry and Photobiology A: Chemistry* (279), 1-7 2014.

F. Petronella, S. Diomedede, E. Fanizza, G. Mascolo, T. Sibillano, A. Agostiano, M.L. Curri, R. Comparelli "Photodegradation of nalidixic acid assisted by TiO₂ nanorods/Ag nanoparticles based catalyst" *Chemosphere*, 91 941-947 2013

Petronella, F.; Fanizza, E.; Mascolo, G.; Locaputo, V.; Bertinetti, L.; Martra, G.; Coluccia, S.; Agostiano, A.; Curri, M. L.; Comparelli, R., "Photocatalytic Activity of Nanocomposite Catalyst Films Based on Nanocrystalline Metal/Semiconductors". *The Journal of Physical Chemistry C* 115 (24), 12033-12040, 2011

Data
15/08/2022