

Curriculum vitae

PERSONAL INFORMATION

Bordiga Silvia

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EXPERTISE AND KNOWLEDGE

I have always applied spectroscopic methods in order to achieve a detailed understanding of the physicochemical nature of a large variety of nanostructured high surface area materials that find applications as heterogeneous catalysts. The peculiarity of my work is to develop a versatile experimental platform based on the combined use of laboratory spectroscopies and advanced techniques available at the synchrotron beam lines in controlled atmosphere. Broad aim of the work is to describe the structure and the number of the active sites; the reaction mechanisms; the origin of catalysts deactivation. Most of these activities are performed thanks to the collaboration with industrial partners. Relevant examples are: 1) TS-1 (Titanium silicalite) a unique catalyst for selective partial oxidation with H₂O₂; 2) Fe-Zeolites, a relevant catalyst in partial oxidation with N₂O; 3) H-Zeolites used for Methanol to hydrocarbon/olefin processes; 4) Cu-exchanged zeolites for ammonia selective catalytic reduction. More recently I'm actively contributing to the development of the emerging field of Porous Metallorganic Frameworks, both contributing to the understanding of known materials and developing new ones for specific applications (e.g. in collaboration with Oslo University: discovery of UiO-66 metallorganic framework topology that is a very thermal and chemical stable metallorganic framework now commercialized; in collaboration with Berkeley university: disclosure of the reaction mechanism of CO₂ adsorption on post-synthetic modified metallorganic framework). The common denominator of my interests is the broad concept of **sustainability**, strongly interconnected with the **energy efficiency** and of the **integration of resources** (possibly renewable) in order to allow a sustainable growth of our society.

EDUCATION

- 1993 PhD in Chemical Science: "New structures in zeolites: synthesis, characterization and properties".
- 1988 Master Degree in Chemistry (110/110 with laude).

CURRENT AND PAST POSITION

- 2016 - present Full professor, Department of Chemistry, University of Turin, Italy
- 2012 - 2017 Professor II, Department of Chemistry, University of Oslo, Norway
- 2001 -2016 Associate professor, Department of Chemistry, University of Turin, Italy
- 1995 - 2001 Researcher, Department of Chemistry, University of Turin, Italy

PUBLICATION RECORDS

From Web of Science (June 2018): **400** publications in peer-reviewed journals, **1** edited book, **22.277** ISI-citations (without self-citations), *h-index* = **87**; **2** Popular papers, and **4** video-camera exposures.

Full list of papers are available at Silvia Bordiga's google scholar page.

MAJOR COLLABORATIONS (outside of the University of Turin)

Karl Petter Lillerud, Unni Olsbye, Stian Svelle (Department of Chemistry, University of Oslo, Norway); Richard Blom and Carlos Grande (SINTEF, Norway); Pablo Beato (HTAS, Denmark); Alessandra Quadrelli (École Supérieure de Chimie Physique Électronique de Lyon, France); Johan Martens (Centre for Surface Chemistry and Catalysis, KU *Leuven*, Belgium); Russell Morris (School of Chemistry, St. Andrews University, UK); Norbert Stock (Institut für Anorganische Chemie, Christian-Albrechts Universität zu Kiel, Germany); Jeffrey Long (Department of Chemistry, University of California, Berkeley, USA); Fabrizio Cavani (Department of Industrial Chemistry

«Toso Montanari», University of Bologna, Italy); Leonardo Marchese (Piemonte Orientale University), Franz Schmidt (Active Oxygens-Performance Oxidants, Evonik); Roberto Millini, Giuseppe Bellussi (Eni); Pascal Raybaud (Direction Catalyse et Séparation IFPEN);

SUPERVISION OF PhD STUDENTS

2014-2016 Alessio Masala: “*Storage materials for gases of technological interests*”; presently in Luxottica; 2013-2015 Alessandro Dani: “*Micro-porous poly(ionic liquid)s for selective adsorption and catalytic applications: synthesis and characterization*”, presently in Evonik; 2012-2014 Filippo Giordanino “*Structure and reactivity of single- and multiple-sites in zeolitic heterogeneous catalysts*”, presently in Luxottica; 2011-2013 Caterina Barzan “*Reactivity of transition metal ions hosted in high surface area materials*”; 2009-2011 Kalaivani Seenivasan “*Spectroscopic Investigation of Silica supported Heterogeneous Ziegler-Natta Catalysts*”; 2009-2011 Lorenzo Mino “*Surface properties and reactivity of TiO₂ nanocrystals: a combined experimental and computational study*”, post-doc at INRIM and then in Physics Department; 2008-2010 Behnam Seyyedi “*Hybrid materials for storage and purification of small gaseous molecule*”; 2008-2010 Katia Barbera “*Investigation of carbonaceous species involved in methanol to hydrocarbon conversion process*”, presently post-doc in CNRS Lyon; 2007-2009 Sachin Chavan “*Characterization of MOFs for gas storage and catalysis*”; presently is a Researcher at ProfMOF spin off at University of Oslo; 2006-2008 Luisa Palumbo “*Acidic zeolites in hydrocarbon chemistry*”; 2004-2006 Laura Regli “*Microporous Materials for Hydrogen Storage*”; 2001-2003 Francesca Bonino “*TS-1 oxidation catalyst: a spectroscopic characterization in working conditions*” presently Researcher at University of Torino; 1999-2002 Alessandro Damin “*Ab initio based methods applied to the study of MgO and TS-1 case systems*” presently Technician at University of Torino.

PRESENT TEACHING ACTIVITIES

Master in Chemistry: Catalysis; Master in Material Science: Physical Chemistry; Bachelor in Material Science: Materials for Energy; Bachelor in Material Science: Materials today
PhD school in Science and innovative technologies: Metal-organic Frameworks

ORGANISATION OF SCIENTIFIC MEETINGS

- 2017 Member of the Scientific Committee of EUROMOF2017 October 29-November 1, Delft Netherland
- 2016 Member of the Organizing Committee of the International winter school, organized by the Physical Chemistry Division of the Italian Chemical Society. 31 January – 5 February, Bardonecchia, Italy.
- 2015 Member of the Scientific Committee of EuroMOF2015 October 11 – 14, Potsdam, Germany
- 2009 Member of the Scientific committee of the International conference ABC (Acid and Base Catalysis), Genova 10-14 May 2009.
- 2009 Member of the Scientific committee of MOFCAT Workshop 2009 “MOFs on the Road to Applications”, 17-19 June, 2009, at the Oslo Innovation Centre in Oslo, Norway
- 2007 Chairwoman of the section “New experimental approaches and characterization under reaction conditions (combinatorial methods included) at EUROPACAT VIII international conference in 2007 (26-31 August in Turku, Finland).

INSTITUTIONAL RESPONSIBILITIES

- 2015-2018 Int. advisor for DEFNET project (EU MC ETN <http://www.defnet-etn.eu/> via H2020).
- 2015-2018 Directive member of Interdivisional Group of Catalysis of the Italian Chemical Society.
- 2012-2018 Director of INSTM Reference Centre at University of Torino.

- 2012-2016 Director of Interdepartmental Centre NIS at University of Torino.
- 2012-2015 Board member of International Acid-Base Catalysis (ABC) group
- 2008-2015 Member of “*Consiglio Direttivo*” of INSTM (“*Consorzio Interuniversitario per la scienza e tecnologia dei materiali*”).
- 2003-2012 Member of the Scientific Committee of the Centre of Excellence NIS at the University of Torino.

RECENT EU FUNDINGS

- 2013-2016 Energy2013-3.5.1.2 Collaborative Project “Advanced Materials and Electric Swing Adsorption Process for CO₂ Capture”. PI of Turin unit and leader of WP7 (Dissemination) (354000 €)
- 2012-2014 FCH JU platform (Fuel Cells and Hydrogen Joint Undertaking) entitled “Novel H₂ storage materials for stationary and portable applications” (Bor4Store). Participant (241712 €)
- 2011-2014 FCH JU platform (Fuel Cells and Hydrogen Joint Undertaking) entitled “Fuel Cell Coupled Solid State Hydrogen Storage Tank” (SSH2S). Participant (488882 €)

RECENT NATIONAL AND REGIONAL FUNDINGS

- 2017-2019 MIUR Bando- PRIN Progetto di ricerca di rilevante interesse nazionale. Prot. 2015CTEBBA PI (120.000 €)
- 2015 University of Turin: Open access-Lab: Up-date Raman Laboratory, PI (90.000 €)
- 2014-2015 Regione Piemonte IV programma Poli di innovazione “HEAT”, PI (92.431 €)
- 2013-2016 MIUR: Mechanisms of CO₂ activation for the design of new materials for energy and resource efficiency. PI (1.000.988 €)

COMMISSIONS OF TRUST

- 2015-2020 Hercules-Science Commission
http://www.herculesstichting.be/in_English/organisation/hercules_science_commission.php
- 2014 Chairwoman of the International panel for the ranking of Matusalem programs submitted by Ghent’s top scientists in all disciplines
- 2007/2008 Member of the International panel for the ranking of Matusalem programs submitted by Ghent’s top scientists in all disciplines
- 2004-2007 Member of the Chemistry committee of ESRF European Synchrotron Radiation Facility
Chairwoman of the Chemistry committee 2007

INVITED SPEAKER

- 2018 *Key note at 7th EuCheMS Chemistry Congress, “The role of spectroscopy in undergoing heterogeneous catalysis” 26 – 30 August 2018, ACC Liverpool, UK*
- 2018 *Key note at ISHHC-18, “CO₂ hydrogenation over Zr-MOF based catalysts”, Sydney, 22 - 25 July 2018.*
- 2018 *Invited speaker at the Gorgon Conference on Catalysis, “The role of spectroscopy in understanding heterogeneous catalysts: Cu-CHA, a model system for applied selective redox catalysis” Colby-Sawyer College in New Hampshire, USA. (June 24-29, 2018).*
- 2018 *Invited speaker at KAUST Research Conference: New Challenges in Heterogeneous Catalysis, “The role of spectroscopies in understanding heterogeneous catalysts” 29-31 January 2018, King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia*
- 2017 *Plenary lecture at EUROPACAT “Addressing the catalyst characterization challenges with spectroscopies Florence, 27-31 August, 2017*
- 2017 *Invited talk at KAUST: “Spectroscopic methods in catalysis and Defect Engineering: Tuning the Porosity and Composition of the Metal-Organic Framework UiO-6”. May 17 and May 18, Arabia Saudita.*

- 2015 *Invited talk at Southern Federal University, Rostov, Russia. September 6. "Metallorganic frameworks what are they and how do we characterize them?"*
- 2014 *Invited talk at IFPEN, Lyon, France. September 24. "Advanced tools and approaches to characterize active sites in zeolites"*
- 2014 *European-Winter School on Physical Organic Chemistry, Bressanone, Italy. February 2-7."Characterization of MOFs by combined vibrational, and electronic spectroscopies*
<http://www.chimica.unipd.it/wispoc/pubblica/index.htm>
- 2013 *Invited key lecture at XVII National Congress of Catalysis GIC 2013 and XI National Congress of Zeolites Science and Technology, Riccione, Italy. September 15-18. "Role of zeolite topologies and morphologies in determining life time and selectivity in MTH process"* <http://www.unibo.it/eventi/gic2013>
- 2013 *Invited lecture at European Congress and Exhibition on Advanced Materials and Processes, Sevilla, Spain. September 8-13. "Characterization of MOFs by combined vibrational and electronic spectroscopies."* Symposium: B4.I Hybrid and Metal-Organic Framework Materials.
- 2013 *Invited lecture at 6th IDECAT ERIC JCAT Conference on Catalysis, Bressanone, Italy. March 3-6. "Conversion of Methanol to Hydrocarbons: zeolite topologies and morphologies in determining life time and selectivity"* <http://www.eric-aisbl.eu/conferences/iejcat-6>
- 2011 *Invited keynote lecture at ISHHC, Berlin, Germany. September 11-18. "NO adsorption on transition metal ions in microporous materials followed by combined use of spectroscopies"*
- 2011 *Invited talk at Technical University of Denmark. "Tailoring MOFs for gas capture and storage"*
- 2010 *Invited talk at NANOMOF Workshop, London, UK. "Combined use of spectroscopies to understand adsorption properties of MOFs"*
- 2010 *Invited talk at University of California, Berkeley, USA. "Combined use of "in situ" spectroscopies and computational techniques to characterize molecularly defined species"*
- 2010 *Invited talk at MIT, Boston, USA. August 27. "Comparative Use of in-Situ Spectroscopic Methods for the Characterization of Active Sites in Porous Materials "*

CONTRACTS WITH INDUSTRIES

BASF (TiO₂ based materials for photocatalysts) 2009-2011; Topsøe (developments of new zeolitic materials) 2008-2016; Saes Getters (new getters for H₂O and CO₂) 2011-2013; ENI (Ethylene Polymerization catalysts) 2011-2013; Infineum (Molibdenum sulphides as lubricant); 2013-2014; Evonik (Ti-silicalites) 2013-2016.