

Research Interests

- Overall: Catalytic Reaction and Process Engineering.
- Specific: Novel Structured Catalysts and Reactors; Synthesis, Analysis and Design of Reactors for Environmental Catalysis.

Recent and Current Research Projects

Major recent projects involve the experimental and modeling study of:

- NH₃ - SCR of NO_x in monolith catalysts for automotive applications (catalytic chemistry, transient kinetics and reactor development: with Daimler AG, DE since 2001: contributed to the development of the BlueTec® technology, commercialized on Mercedes-Benz vehicles since 2005).
- NH₃ - SCR of NO_x in monolith catalysts for automotive applications (influence of monolithic substrate configuration: with Corning Inc., USA): 2006 - 2012
- Investigation of Ammonium Nitrate promotion of the low-T SCR-DeNO_x activity (formerly with Haldor Topsoe A/S; currently within the EU FP7 Project CORE): since 2010
- Investigation of SCR-DPF catalytic systems for the combined removal of NO_x and soot (with MTU Friedrichshafen, DE): since 2011
- NH₃ - SCR of NO_x over Cu-promoted zeolite catalysts (influence of the zeolites properties on catalytic chemistry: with Johnson Matthey, UK): since 2013
- CPO of hydrocarbons in structured reactors (kinetics, reactor modeling, comparison of cat. supports).
- Fischer-Tropsch Synthesis (detailed kinetics, SBC reactor modeling, new reactor configurations: with ENI, Italy, and IFP, France): since 1998.
- Methanol Synthesis over conductive structured catalysts (monoliths and open-cell foams) (with Total Petrochemicals, France): 2011 - 2013
- Heat transfer in conductive honeycomb catalyst supports for strongly exothermic chemical processes (with Corning Inc., USA and ENI, Italy): since 2003
- Mass and heat transfer in cellular foams and metallic filters as novel catalyst carriers: since 2005

Leader of the Research Project of Relevant National Interest (PRIN) “Intensification of Catalytic Processes for Clean Energy, Low-Emission Transport and Sustainable Chemistry using Open-Cell Foams as Novel Advanced Structured Materials” (IFOAMS, 2012-2015) funded by the Italian Ministry of Education: overall budget of 1.6 Million Euro.

Responsible of the Research Unit of Politecnico di Milano in the EU FP7 Project CORE (“CO₂ Reduction for long distance transport”, 2012-2015: www.co2re.eu).

Scientific Publications

Author or coauthor of over 200 scientific publications in international journals or books (ISI h-index=45, no. of citations > 5800; http://scholar.google.it/citations?user=Gql_OgYAAAAJ&hl=it, <http://www.researcherid.com/rid/A-3311-2012>).

Inventor of 12 national and international patents.

Selected Honors and Activities

- Member of the International Advisory Board of the Competence Center for Catalysis at Chalmers Technical University, Göteborg, Sweden (2008 - present)
- Included in the list of Top Italian Scientists (VIA-Academy, www.topitalianscientists.org)
- Invited Academic Member of the EUROKIN Consortium, 2003 – present (www.eurokin.tudelft.nl)
- Member of the Editorial Board of “Reviews in Chemical Engineering”, 2011 – present.
- Member of the Editorial Board of “International Journal of Chemical Reactor Engineering”, 2013 – present.
- Chairman of Scientific Committee, ICOSCAR - 3, 2009.

- Member of Scientific Committees of several Conferences, including: ICOSCAR - 2, 2005; ICOSCAR - 4, 2013; ISCRE 23, 2014; CHEMREACTOR 21, 2014.
- Best Poster Award at the 6th International Conference on Environmental Catalysis (ICEC 2010)
- Best paper award – Division of Fuel Chemistry, ACS Meeting, March 2005.
- “K-idea” award and “Energy” award for the patent “APPARATUS AND PROCESS FOR REDUCING THE CONTENT OF NITROGEN OXIDES IN EXHAUST GASES OF COMBUSTION SYSTEMS” (2010).
- Federchimica Award for Research – Federation of the Italian Chemical Industries, 1995.
- Prometeo National Award for Young Scientists, Milano, 1990
- Member of Directive Board of the Italian Chemical Engineering Research Group, 2006 - 2009
- Member of Directive Board of the Industrial Chemistry Division, Italian Chemical Society, 1998-2004.
- AIChE Fellow, 1981 – present.

Selected Invited Presentations and Lectures (2000 – 2014)

- CANMET Energy Technology Centre, Varennes, Quebec, CA, *Research Experience in Modeling of Structured Catalysts*, 4/00 (Invited seminar).
- DaimlerChrysler AG, Stuttgart, DE, *Modeling of SCR-DeNO_x Reactors*, 05/01 (Invited seminar).
- Corning Research Center, Sullivan Park, NY, *Theoretical and Experimental Study of Structured Catalysts with High Thermal Conductivity*, 6/01 (Invited seminar).
- Johnson Matthey Catalysts Research Center, Billingham, UK, *Advanced Approaches to the Kinetic Study of Catalytic Reactions: a) Transient Methods; b) Structured Lab-scale Reactors*, 06/03 (Invited lecture for the EUROKIN Consortium).
- Delphi Research Labs, Dearborn, MI, *Structured and Packed-bed Reactors for the Catalytic Partial Oxidation of CH₄ at Short Contact Times: a Comparative Analysis by Mathematical Modeling*, 4/05 (Invited seminar).
- ICOSCAR-2, Delft, NL, *Honeycomb Catalyst Supports with High Thermal Conductivity for Gas/Solid Processes. A Review*, 10/05 (Invited plenary lecture).
- Shell Research Centre, Amsterdam, NL, *Novel Catalyst Carriers for Improved Operation of Fixed-Bed Reactors*, 05/06 (Invited seminar).
- ENI Research Center, San Donato Milanese, IT, *Honeycomb Catalyst Supports with High Thermal Conductivity for Gas/Solid Processes*, 10/06 (invited seminar).
- Delft ChemTech, TU Delft, NL, *Heat Effects in Catalytic Reactors: Use of Structured Internals*, 10/06 (Invited lecture in NIOK Advanced Catalysis Engineering Course).
- NASCRE-2, Houston, TX, *Kinetic and Mechanistic Study of the NO/NO₂-NH₃ SCR Reaction over a V-based Catalyst for Diesel Exhaust After treatment*, 02/07 (Invited keynote lecture).
- Corning Research Center, Sullivan Park, NY, *Mechanistic, Kinetic and Modeling Study of NO/NO₂-NH₃ SCR for Diesel Exhausts Aftertreatment*, 02/07 (invited seminar).
- Center for Catalytic Science & Technology, University of Delaware, Newark, DE, USA, *NH₃-SCR for Aftertreatment of Vehicle Emissions: Catalytic Mechanism, Detailed Kinetics and Monolith Converter Model*, 02/07 (Invited seminar).
- 10th Annual CLEERS workshop, Dearborn, MI, USA; *NH₃-SCR for aftertreatment of vehicle emissions: catalytic mechanism, detailed kinetics and monolith converter model*, 05/07 (Invited lecture).
- International Symposium on Catalysis Engineering, Delft (NL), *Gas/Solid Mass Transfer Characteristics of Foams and Metallic Filters as Supports for Structured Catalysts*, 06/07 (Invited plenary lecture)
- EUROKIN 10th Anniversary Symposium, Lyon (FR), *Conductive monolithic catalysts: Development and pilot tests for the industrial oxidation of o-xylene to phthalic anhydride*, 05/08 (Invited plenary lecture)
- Topsoe Catalysis Forum, Munkerpugaard, DK, *Structured Catalysts in Environmental Catalysis* 08/09 (Invited plenary lecture)

- MODEGAT 1, Bad Herrenalb, DE, *Tutorial on SCR Modeling*, 09/09 (Invited plenary lecture)
- Delft ChemTech, TU Delft (NL), *Heat Effects in Catalytic Reactors: Use of Structured Internals*, 10/09 (Invited lecture in NIOK Advanced Catalysis Engineering Course).
- Paul Scherrer Institut, Villingen (CH), *NO/NO₂-NH₃ SCR over V-based and Fe- and Cu-zeolite catalysts: kinetics and mechanism*, 10/09 (Invited seminar)
- Fritz Haber Institut, Berlin (DE), *NH₃-SCR for Diesel Emission Control: Catalytic Mechanism and Kinetics by Transient Response Methods*, 11/09 (Invited seminar)
- Symposium on “Structuring catalysts and multiphase reactors”, TU Delft, NL, *Micro-structured Catalytic Materials for Intensification of Gas-Solid Processes*, 02/10 (Invited lecture)
- Michigan Catalysis Society Meeting, Livonia (MI), USA, *Mechanistic Transient Kinetic Analysis of the NH₃-NO/NO₂ “Fast” SCR Reaction Over a Fe-ZSM-5 Catalyst for Automotive Application*, 02/11 (Invited lecture)
- University of Houston (TX), USA, *NO/NO₂-NH₃ SCR over V-based and Fe- and Cu-zeolite catalysts: kinetics and mechanism*, 02/11 (Invited seminar)
- University of Houston (TX), USA, *Micro-Structured Catalysts for Process Intensification*, 02/11 (Invited seminar)
- University of Michigan (MI), USA, *Micro-Structured Catalysts for Process Intensification*, 02/11 (Invited seminar)
- General Motors R & D Center, Warren, MI (USA), *NO/NO₂-NH₃ SCR over V-based and Fe- and Cu-zeolite catalysts: kinetics and mechanism*, 02/11 (Invited seminar)
- ECCE 8, Berlin, DE, *Assessing the potential of conductive structured catalysts for selective oxidation processes in technical multitubular packed-bed reactors*, 09/11 (Invited keynote lecture)
- CCRE, TU München (DE), *Conductive monolith catalysts for the intensification of the Fischer-Tropsch synthesis in tubular reactors*, 10/11 (Invited plenary lecture)
- AIChE Meeting, Minneapolis (MN), USA, *Micro-structured Catalysts for Process Intensification*, 10/11 (Invited lecture for plenary session on Process Intensification)
- 3rd Axisuite User Workshop, Berlin, DE, *NH₃-SCR Modeling*, 6/12 (Invited lecture)
- Oak Ridge National Laboratory, Knoxville (TN); USA, *Is NO oxidation to NO₂ the rate determining step of the Standard SCR reaction?* – 10/12 (Invited seminar)
- Johnson Matthey Technology Centre, Sonning Common, UK, *Mathematical modeling of dual-layer Ammonia Slip Catalysts*, - 10/12 (Invited seminar)
- IMechE Seminar, London, UK, *The Mechanism of Ammonia SCR: HowIt Works* 11/12 (Invited plenary lecture)
- Jahrestreffen Reaktionstechnik 2013, Würzburg (DE), *Enhancing the heat management in tubular reactors loaded with μ -structured catalysts* – 5/13 (Invited plenary lecture)
- POSTECH, Pohang, S. Korea, *Is NO oxidation to NO₂ the rate determining step of the Standard SCR reaction?* – 8/13 (Invited seminar)
- 9th World Congress of Chemical Engineering, Seoul, S. Korea, *Modelling of NH₃-SCR Converters* – 8/13 (Invited keynote lecture in the Automotive Catalysis session).
- Congress of the Spanish Catalysis Society (SECAT 213), Sevilla, Spain, *Structured catalysts for the conversion of syngas into valuable fuels* – 6/13 (Invited plenary lecture)
- IX Europacat, Lyon, FR, *Mechanistic insights in the NH₃-NO/NO₂ SCR reactions for Diesel exhaust aftertreatment* – 9/13 (Invited keynote lecture; presented by Prof. I. Nova)
- MODEGAT III, Bad Herrenalb, DE - *Tutorial on SCR Modeling*, 09/13 (Invited plenary lecture)
- CBI Kolloquium, Erlangen (DE), *Heat transfer properties of structured catalyst supports for exothermic reactions: Enabling small-scale methanol synthesis?* – 12/13 (Invited lecture)
- School of Chemistry and Chemical Engineering, Queen’s University Belfast, UK - *Micro-Structured Catalysts for the Intensification of Energy-Related Processes* – 4/14 (Invited lecture)
- Doctoral School in Materials Science, University of Sevilla, Spain, *NH₃-SCR for Diesel Emission Control: Catalytic Mechanism and Kinetics by Transient Response Methods* 5/14 (Invited seminar)
- 8th International Conference on Environmental Catalysis, Asheville, NC, USA, *Investigation of the*

Standard SCR Reaction Mechanism at Low T by Chemical Trapping Techniques – 8/14 (Invited keynote lecture)

- CAMURE 9, Lyon, France, *Conductive Structured Catalysts for Syngas Conversion* – 12/14 (Invited plenary lecture)

Contacts

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