

1. Curriculum vitae and Research Profile of Alessandra Beretta

Education and career

1992 – Master in Chemical Engineering at Politecnico di Milano, cum laude

1994-1995 Fourteen months stay as visiting PhD student at Lehigh University (PA, USA), after receipt of a Fulbright Fellowship.

1996 – PhD in Industrial Chemistry at Università Statale di Milano.

1998 – Assistant professor at Dipartimento Chimica Industriale, Politecnico di Milano.

2001 – Associate professor at Dip. Chimica, Materiali e Ingegneria Chimica, Politecnico di Milano

2008 – A.B. joins the newly established Dipartimento di Energia, Politecnico di Milano

2010 – Abilitation for full professorship at Politecnico di Torino.

2013 – Full professor of Chemical Engineering at Politecnico di Milano

Research areas

Catalysis for energy conversion and environmental protection, catalytic processes for the exploitation of natural gas, hydrogen production from fossil and renewable fuels, modeling of catalytic reactors, transport phenomena in structured reactors, kinetics of the conversion of light hydrocarbons to syngas or olefins to very short contact times, interaction between surface reactions and gas phase reactions.

Honors

1992 – Best Master Thesis Award , 12ISCRE .

1994 – Fulbright Fellowship for Italy-USA scholar exchange

1996 - Philip Morris Award for PhD Theses

2000 - “Catalysis Congress Prize” , 12° ICC

2001 - “The Young Scientist Award”, ISCRE.

2010 – Invited Key-note speaker al 9th NGCS – Natural Gas Conversion Symposium, Lyon.

2011 – Invited Key-note speaker al 22th NAM – North American Catalysis Meeting, Detroit.

2011 – Invited speaker at “Anders Holmen Seminar”, Trondheim, december 2011

2011 – “VIP paper” in Angewandte Chemie Int. Ed with cover page.

2015 – Invited Key-note speaker at 18th Brazilian Congress on Catalysis

2016 – Plenary Lecture at XXXIX Meeting of the Italian Section of the Combustion Institute

2016 – Member of the Scientific Advisory Board of the iCSI, center for the Industrial Catalysis Science and Innovation, funded by the Research Council of Norway.

2017 – Scientific organization of XIII EUROPACAT 2017: Chair of the Catalysis for Energy Topic

2017 – Deputy Head for Research of the Department of Energy, Politecnico di Milano.

Grants

2018 - Coordinator of "Energy for Motion", a 9 M€ 5-years project funded by MIUR, the Italian Ministry of Education, Research and University within the "Departments of Excellence Program"; the project consists of a development plan of the Department of Energy, Politecnico di Milano, focused on energy technologies for transportation.

Four major research pillars are included in the project: H₂ and new fuels, new engines and aftertreatment solutions, fuel cells, batteries and electric vehicles. The funding includes resources for the recruitment, infrastructures and graduate teaching programs.

2016 – Scientific coordinator of WP - Fuel processor development (750 k€) within the MICROGEN 30 project, a research and development project for the design and prototyping of a combined heat and power system, funded by MISE, the Italian Ministry for Industrial Development.

A.B. and the colleagues of the LCCP group are involved in the development of a combined heat and power system for residential applications; in particular the Polimi unit is involved in the development of a multi-stage catalytic fuel processor consisting of steam reforming, two water gas shift stages, CO – preferential oxidation or methanation for the production of a H₂-rich stream, fueling a PEM fuel cell.

2015 – Scientific coordinator of the Polimi unit, within the national project HERCULES – Heterogeneous robust catalysts for the conversion of low value biomass streams, 250 k€, funded by MIUR.

A.B. coordinates the Polimi unit which is in charge of the comprehension of the chemical pathways through which model molecules (representative of the oxygenates produced by hydrolysis of waste cellulosic materials) convert into more complex molecules or crack into CO and H₂.

2005-2010 - Scientific coordinator of the Polimi unit, within two national projects dealing with the small scale production of H₂-rich streams from fossil and biomass-derived fuels.

Noble metal containing catalysts and structured reactors are optimized for the intensification of H₂ production in small scale applications.

Industrial research projects

2015 to present – Kinetic modelling of Hg oxychlorination over V-based SCR catalysts, funded by Johnson Matthey

A kinetic investigation is performed at LCCP under the guidance of AB for the understanding of this complex reaction. Kinetic testing, operando techniques, pilot scale testing, and the means of kinetic and reactor modelling are the approach that lead the project in a strict cooperation with the JM research center.

2017 to present – Experimental and modelling characterization of the chemical ageing of T-sensors in Oil and Gas applications, funded by Endress Hauser

The comprehension of the sensitivity and reliability of temperature measurements in Oil and Gas application is crucial for the control of several catalytic reactors. The project focuses on the experimental and modelling characterization of the thermal behavior and the T-sensors response in processes such as HDS of heavy oils.

2012-2014 Modelling analysis of SCR reactors for stationary applications: effect of ammonia oxidation, funded by ENEL

AB and colleagues at LCCP have a well assessed competence on the modelling of transport phenomena in monolithic catalysts; those competence were herein spent to comprehend how intraparticle diffusion affect the overall performance of the SCR reactor in terms of desired (NO reduction, Hg oxidation) and undesired (So₂ oxidation) reactions and analyze the effect of co-existence of the chemical processes.

2010 – 2012 Microseepage, remote sensing of CH₄ emissions from oil reservoirs, funded by Eni.
AB and a team of researchers in LCCP have characterized the diffusion and dispersion of gaseous components across soils and rocks

Publications

Alessandra Beretta is the author of over 100 publications, published in journals and books in the time period 1994 - 2018. Among them:

- 85 were published in international journals and are traced by SCOPUS (1995-2018) and ISI Web of Science (1994-1995).
- 8 were published in books or journals (not-ISI publications).
- 18 were published in national books or journals

Alessandra Beretta is the author of several communications presented at national and international conferences.

Considering uniquely the SCOPUS data bank, Alessandra Beretta has a Citation Index above 2000 and Hirsch-Index of 29. In most papers, she is the corresponding author.

A special mention goes to the paper: Beretta et al. "Synergy of Homogeneous and Heterogeneous Chemistry Probed by In Situ Spatially Resolved Measurements of Temperature and Composition", *Angewandte Chemie International Edition* vol 50, pages 3943–3946, April 18, 2011. This paper has been selected as VIP – Very Important Paper (5% Top Articles) and has been honored by the cover page.

Her competence in the field of chemical reaction engineering and kinetic study of catalytic processes has gained her the invitation to part of the prestigious Advisory Committee of the iCSI center; by citing the invitation letter from the ICSI Managing Board "we invite three prominent academic researchers (prof. Alessandra Beretta from Politecnico di Milano, prof. Enrique Iglesia from UC Berkeley, prof. Graham Hutchings, from Cardiff University) to advice on the direction of the Centre, assess the quality of the research, and to act as inspiration to the young reserchers".

Alessandra Beretta acts as a reviewer for several international journals in the fields of catalysis and chemical engineering, She recently acted as a reviewer of large research programs for the Slovenian Research Agency.

Teaching activity

Alessandra Beretta teaches in the Master Degree Programs of Chemical Engineering and Energy Engineering at Politecnico di Milano. Namely, she teaches:

- 1) Process Control and Instrumentation Laboratory (10 credits course, Chemical Engineering)
- 2) Fuels from fossil and renewable sources (8 credits course, Energy Engineering)

Alessandra Beretta has been the advisor of over 600 master students and of 8 PhD students.

Alessandra Beretta has been on several occasions an invited lecturer at the National School of Catalysis and has cooperated with Federchimica for Training Courses in catalysis.

She has been also invited lecturer at: the summer PhD school for graduate students in chemical engineering at the Karlsruhe Institute of Technology (July 2011, Bud Herrenalb), the NTNU seminar program in Trondheim (Norway) in several occasions from 2001 to present,, the Brazilian Catalysis School in 2015.

In several occasions (from 1999 to 2015) she has been invited as Principal Opponent for the evaluation of PhD theses in the field of exploitation of natural gas at NTNU (Norwegian Technical University) in Trondheim and at the University of Oslo.

She has taught at NTNU (August 20-28, 2012) within an Erasmus Teaching Mobility program.