



CURRICULUM VITAE of the Scientific and Academic activity of Dr. ELENA GROPPA

PERSONAL INFORMATION

Family name, First name: Groppo, Elena
Researcher unique identifiers: ORCID 0000-0003-4153-5709, Scopus Author ID: 8791762900
Date of birth: 16/11/1978
Nationality: Italian

EDUCATION

2006 *PhD in Chemical Sciences*
Faculty of Science/ Dep. of Inorganic, Physical and Material Chemistry/ University of Torino/ Italy. Final dissertation: "Structure and reactivity of the active centres on the Cr/SiO₂ Phillips catalyst: a challenge for characterization methods", supervisor: Prof. A. Zecchina
2002 *Master Science Degree in Materials Science cum laude*
Faculty of Science/ Dep. of Inorganic, Physical and Material Chemistry/ Univ. of Torino

CURRENT POSITION

2017 (april) *Associate Professor*
Department of Chemistry/ University of Torino/ Italy
2014 – 2017 *Temporary Researcher RTDB (Legge Gelmini, art. 24 c.3-b L. 240/10)*
(march) Department of Chemistry/ University of Torino/ Italy

PREVIOUS POSITIONS

2012 – 2014 *Temporary Researcher RTDA (Legge Gelmini, art. 24 c.3-a L. 240/10)*
Dep. of Chemistry/ University of Torino/ Italy
2010 – 2012 *Technician*
Dep. of Chemistry/ University of Torino/ Italy
2005 – 2010 *Post Doctoral Fellow*
Dep. of Chemistry/ University of Torino/ Italy

FELLOWSHIPS AND AWARDS

2014 *Ivano Bertini Gold Medal* from the Italian Chemical Society (SCI), conferred to a young researcher distinguishing for significant contributions in Chemical Sciences
2012 *Scientific National Qualification* for the section 03/A2 – Models and methodologies for Chemical Sciences (CHIM/02), Second Level, MIUR/ Italy.
2012 *Scientific National Qualification* for the section 03/B2 – Chemical Fundamentals of Technologies (CHIM/07), Second Level, MIUR/ Italy.
2010 *Gerhard Ertl Young Investigator Award*, selected among the first 5 best candidates
2008 *Award for the best Young Scientist* from Società Italiana Luce di Sincrotrone (SILS)/ Italy
2002 *Premio Optime* from Unione Industriale di Torino for the best M.Sc. degree curriculum in Material Science, University of Torino/ Italy
2002 *Medaglia d'Argento* for the best M.Sc. thesis in Material Science, University of Torino/ Italy



SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

2007 – 2016 **5 Postdoc**: W. Liu, K. Seenivasan, K.S. Thushara, C. Barzan, M. D'Amore
8 PhD in Chemical and Materials Science: J. Estephane, W. Liu, K. Seenivasan, C. Barzan, A. Lazzarini, A. Piovano, G. Martino, M. Carosso
12 Master Students in Materials Science, Chemistry, Industrial Chemistry: D. Gianolio, R. Caugdan, L. Diano, C. Barzan, S. Sabatino, F. Zedde, M. Caruso, A. Piovano, G. Martino, M. Carosso, E. Vottero, G. Lingua
Faculty of Science/ Department of Chemistry/ University of Torino/ Italy

TEACHING ACTIVITIES

2008 – today Lecturer – Materials for sports, MSc Degree in Sports/ SUISM School of Torino
2008 – today Lecturer – Catalysis, MSc Degree in Chemistry/ University of Torino
2012 – today Lecturer – Physical Chemistry (with laboratory), MSc Degree in Materials Science (in English)/ University of Torino
2013 – 2015 Lecturer – Structural and surface analysis (with laboratory), MSc Degree in Environmental Chemistry/ University of Torino
2015 – today Lecturer – Spectroscopic Methods and Microscopies (with laboratory), Bachelor Degree in Materials Science/ University of Torino

MEMBERSHIPS OF SCIENTIFIC SOCIETIES

2010 – today Associated Member, Italian Chemical Society (SCI)

INSTITUTIONAL RESPONSABILITIES

2010 – today Member of the Council of Department of Chemistry/ University of Torino/ Italy
2015 – today Member of the Commissione Orientamento for the Bachelor and Master Degree in Materials Science/ Department of Chemistry/ University of Torino/ Italy

MAJOR SCIENTIFIC COLLABORATIONS

E. A. Quadrelli, C2P2/ CNRS Lyon/ France
C. Otero Arean, Department of Chemistry/ University of Balearic Islands/ Spain
B. M. Weckhuysen, Department of Chemistry/ Utrecht University/ Netherlands
S. Scott, University of California Santa Barbara/ U.S.A.
K.-J. Jensen, Telemark University College/ Norway
F. Cavani, University of Bologna/ Italy
A. Longo, European Synchrotron Radiation Facility/ Grenoble/ France
A. Piovano, Institute Laue Langevin/ Grenoble/ France
G. Agostini, Leibniz-Institut für Katalyse e.V. an der Universität Rostock (LIKAT)/ Rostock/ Germany
R. Pellegrini, Chimet SpA/ Italy
A. Sommazzi and F. Masi, ENI Istituto Guido Donegani and Versalis S.p.A./ Italy
K. Cann, Univation Technologies, LLC/ U.S.A.
T. Monoi, Japan Polyethylene Corporation/ Japan
J. Lindroos and A. Follestad, Norner Research AS/ Norway



PERSONAL RESEARCH FUNDINGS

Project Title	Funding Source	Amount (Euros)	Period
New oligomerization ethylene catalysts	BASF SE	16.000	6 months
Spectroscopic characterization of Ziegler-Natta catalysts	Versalis S.p.A.	70.000	2 years
Application of UV spectroscopy for the characterization of supported polyolefin catalysts	Univation Technology	7.000	1 year
Pd-based catalysts for hydrogenation reactions	Chimet S.p.A.	45.000/year	11 years
Selective Heterogeneous catalysts for Olefin Conversion (Progetto di Ateneo)	Compagnia di San Paolo	85.000	2 years
Analysis of Chromium Catalysts for Ethylene Polymerization	Japan Polyethylene Corporation	7.000/year	2 years

SCIENTIFIC PRODUCTION IN BRIEF

<i>Reviews</i>	6 (ISI Journals)
<i>Papers</i>	78 (ISI Journals), which have received about 2800 citations
<i>h-index</i>	28 (Scopus)
<i>Books</i>	4 Chapters as co-author
<i>Editor</i>	Co-Editor of the book "Selective Nanocatalysts and Nanoscience, Wiley-VCH, 2011; DOI: 10.1002/9783527635689
<i>Reviewer Activity</i>	She acts as referee for the following Peer Reviewed Journals (about 10 papers/year): ACS Catalysis, Angewandte Chemie, Applied Catalysis A, Applied Catalysis B, Chemistry of Materials, ChemCatChem, Chemistry - A European Journal, Journal of American Chemical Society, Journal of Catalysis, Journal of Physical Chemistry C, JPC Letters, PCCP.
<i>Congresses</i>	More than 160 presented works, among which 8 invited lectures at International Congresses and 4 invited lectures at National Congresses. Chairman in 5 Sessions of International Congresses.
<i>Experiments</i>	EG participated to more than 45 experiments approved by an international peer-review committee at several Large Scale Facilities: LURE SuperACO (Paris, F), Daresbury (UK), ESRF (Grenoble, F), ELETTRA (Trieste, I), SLS (Zurich, CH); ISIS (Oxford, UK). EG was the main responsible of more than 10 experiments.



SCIENTIFIC LEADERSHIP POTENTIAL

After studying Material Sciences (Optime Award for the Best Master Degree Thesis), in 2002 E. Groppo joined a PhD Programme in Chemistry. Her thesis project was anchored in the research unit of Professor Zecchina. In her 11 years of experience in physical chemistry and heterogeneous catalysis E. Groppo acquired an exhaustive knowledge of **several structural and surface characterization techniques**, some of them based on the use of synchrotron and neutrons large scale facilities. Since then, she has been able to evolve in an independent way, distinguishing for her ability to apply these techniques to the investigation of complex catalytic systems also in reaction conditions.

Among her main scientific interests, there is the **understanding of the physical-chemical working principles of heterogeneous catalysts**. In particular, the interests of E. Groppo have been concentrated on two fields of research, as demonstrated by the scientific output, the number of industrial contracts, and the MsC Thesis and PhD projects she has supervised.

- 1) The first one involves **heterogeneous catalysts for olefin polymerization**, in particular the Phillips and the Ziegler-Natta catalysts, which have a strategic role in the polyolefin industry. The rational use of complementary characterization techniques allowed E. Groppo to increase the knowledge on the structure of the active sites of these catalysts, and to observe extremely labile reaction intermediates, with important consequences in terms of reaction mechanisms. Her new challenge is the rational manipulation of the active sites. Her recent papers demonstrate that it is possible to investigate the effects that modifying agents used in the industrial practice have on the structure of the active sites, and to correlate these effects with the catalysts performances. These results have a high potential impact in the field of catalytic olefin conversion. E. Groppo is a recognized researcher in this field, as testified by the great number of invitations to International Congresses.
- 2) The second main topic concerns **catalysts based on supported metal nanoparticles** for selective hydrogenation and oxidation reactions, that have a strategic role in the chemical industry. In the last years E. Groppo expanded the interest from the investigation of the metal phase to the detailed characterization of the physico-chemical properties of the supports and of the intimate relation existing between the support and the metal nanoparticles, in most of the cases by adopting a large number of characterization techniques, also in operando conditions.

10 MOST RELEVANT PUBLICATIONS

Selection of papers on olefin polymerization catalysts

1. D'Amore, M.; Thushara, K. S.; Piovano, A.; Causà, M.; Bordiga, S.; **Groppo, E.***, Surface Investigation and Morphological Analysis of Structurally Disordered MgCl_2 and $\text{MgCl}_2/\text{TiCl}_4$ Ziegler-Natta Catalysts, *ACS Catal.* 6, (2016), 5786-5796.
2. **Groppo, E.*** Damin, A.; Otero Arean, C.; Zecchina, A., Enhancing the initial rate of polymerisation of the reduced Phillips catalyst by one order of magnitude, *Chem. Eur. J.* 17, (2011), 11110-11114.
3. Barzan, C.; Gianolio, D.; **Groppo, E.*** Lamberti, C.; Monteil, V.; Quadrelli, E. A.; Bordiga, S., The effect of hydrosilanes on the active sites of the Phillips catalyst: The secret for in situ α -olefin generation, *Chem. Eur. J.* 19, (2013), 17277-17282.
4. Barzan, C.; **Groppo, E.*** Bordiga, S.; Zecchina, A., Defect sites in H_2 -reduced TiO_2 convert ethylene to high density polyethylene without activator, *ACS Catal.* 4, (2014), 986-989.
5. Piovano, A.; Thushara, K. S.; Morra, E.; Chiesa, M.; **Groppo, E.*** Unraveling the Catalytic Synergy between Ti^{3+} and Al^{3+} Sites on a Chlorinated Al_2O_3 : A Tandem Approach to Branched Polyethylene, *Angew. Chem. Int. Ed.* 55, (2016), 11203-11206.

Paper 1 deals with a traditional catalyst for olefin polymerization ($\text{MgCl}_2/\text{TiCl}_4$ Ziegler-Natta catalyst), which has been re-investigated with state-of-the-art computational and experimental approaches, reaching an unprecedented level on knowledge on its surface chemistry.



Papers 2 and 3 contain two examples of rational design of the well-known Phillips catalyst for polyethylene production. By applying a large number of spectroscopic techniques, it was possible to unravel the structure of the modified sites at a molecular level and to correlate the structure of the active sites to the catalytic performances.

Papers 4 and 5 are two successful examples of designing, synthesis and characterization of novel heterogeneous catalysts for polyethylene production.

Selection of papers on supported metal nanoparticles

6. **Groppo, E.;*** Agostini, G.; Piovano, A.; Muddada, N. B.; Leofanti, G.; Pellegrini, R.; Portale, G.; Longo, A.; Lamberti, C., Effect of reduction in liquid phase on the properties and the catalytic activity of Pd/Al₂O₃ catalysts, *J. Catal.* 287, (2012), 44-54.
7. Agostini, G.; Lamberti, C.; Pellegrini, R.; Leofanti, G.; Giannici, F.; Longo, A.; **Groppo, E.;*** Effect of pre-reduction on the properties and the catalytic activity of Pd/carbon catalysts: A comparison with Pd/Al₂O₃, *ACS Catal.* 4, (2014), 187-194.
8. Lazzarini, A.; Piovano, A.; Pellegrini, R.; Leofanti, G.; Agostini, G.; Rudić, S.; Chierotti, M. R.; Gobetto, R.; Battiato, A.; Spoto, G.; Zecchina, A.; Lamberti, C.; **Groppo, E.;*** A comprehensive approach to investigate the structural and surface properties of activated carbons and related Pd-based catalysts, *Catal. Sci. Technol.* 6, (2016), 4910-4922.
9. **Groppo, E.;*** Agostini, G.; Borfecchia, E.; Wei, L.; Giannici, F.; Portale, G.; Longo, A.; Lamberti, C., Formation and growth of Pd nanoparticles inside a highly cross-linked polystyrene support: Role of the reducing agent, *J. Phys. Chem. C* 118, (2014), 8406-8415.
10. Dani, A.; Crocellà, V.; Maddalena, L.; Barolo, C.; Bordiga, S.; **Groppo, E.;*** Spectroscopic study on the surface properties and catalytic performances of palladium nanoparticles in poly(ionic liquid)s, *J. Phys. Chem. C* 120, (2016), 1683-1692.

Papers 6 and 7 are two examples of the potential of a multi-technique approach in the investigation of the physical-chemical properties of supported metal nano-particles, in relation with their catalytic performances.

Paper 8 deals with a detailed characterization of the structural and surface properties of activated carbons, which are among the most employed supports for metal nanoparticles.

Papers 9 and 10 are two successful examples of designing, synthesis and characterization of novel heterogeneous catalysts based on metal nano-particles supported on less conventional supports.

INVITED CONTRIBUTIONS TO NATIONAL AND INTERNATIONAL CONGRESSES

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| 2016-06-28 | <i>4th Blue Sky Conference</i> , Sorrento (Italy) - Surface investigation and morphological analysis of structurally disordered MgCl ₂ and MgCl ₂ /TiCl ₄ Ziegler-Natta catalysts |
| 2015-09-14 | <i>Congresso della Divisione di Chimica Industriale</i> , Salerno (Italy) - Looking at Ziegler-Natta catalysts from another perspective |
| 2015-11-24 | <i>World Polyolefin Congress 2015</i> , Tokyo (Japan) - Diverse reductants for Cr(VI)/SiO ₂ lead to reduced chromium sites differently active |
| 2014-12-11 | <i>Catalytic olefin polymerization and high performance materials</i> , ISMAC, Milano (Italy) - Looking inside Ziegler-Natta catalysts |
| 2014-10-22 | <i>International Workshop on Olefin Polymerization & High Performance Polyolefins</i> , Shanghai (R. P. China) - A new life for an evergreen: new experimental approaches for Ziegler-Natta catalysts |
| 2014-09-06 | <i>XXV SCI Congress</i> , Arcavacata (Italy) - "Ivano Bertini" Lecture, Selective catalysis & spectroscopies: an essential pair at the frontier between fundamental and industrial chemistry |
| 2014-09-06 | <i>XXV SCI Congress</i> , Arcavacata (Italy) - New experimental approaches for Ziegler-Natta catalysts |



- 2013-05-31 *E-MRS 2013 Spring meeting*, Strasbourg (France) - Heterogeneous Ziegler-Natta catalysts for ethylene polymerization: generation of the active Ti sites as followed by XAS-XES techniques
- 2012-03-27 *8th LSP/JAIST International Colloquium on Heterogeneous Ziegler-Natta Catalysts*, Kanazawa (Japan) - Spectroscopic methods applied to heterogeneous polymerization catalysts: what can help
- 2010-06-24 *7th LSP/JAIST International Colloquium on Heterogeneous Ziegler-Natta Catalysts*, Sorrento (Italy) - Transforming a Phillips into a Ziegler-Natta catalyst by tailoring the structure of the active sites
- 2010-09-15 *X School GIC*, Palermo (Italy) - Ethylene polymerization catalysts: a frontier for spectroscopic methods
- 2009-05-19 *III IDECAT Conference on Catalysis*, Porquerolles (France) - Catalysts to make polymers and polymers to make catalysts: The point of view of a spectroscopist

She was **chairman** in one session of the following congresses:

- 2006-04-23 *II International Congress on Operando Spectroscopy: Fundamental and Technical Aspects of Spectroscopy of Catalysts under Working Conditions (Operando - II)*, Toledo (Spain)
- 11-09-2011 *15th International Symposium on the Relations between Homogeneous and Heterogeneous Catalysis (ISHHC XV)*, Berlin (Germany)
- 01-09-2013 *11th European Congress on Catalysis – EuropaCat-XI*, Lyon (France)
- 2014-10-22 *International Workshop on Olefin Polymerization & High Performance Polyolefins*, Shanghai (R. P. China)
- 2015-11-24 *World Polyolefin Congress 2015*, Tokyo (Japan).

ORGANIZATION OF SCHOOLS AND CONGRESSES

1. Member of the Local Organizing Committee for the International *Winter School “Molecules @ Surfaces”*, 2016-01-31 – 2016-02-5, Villaggio Olimpico di Bardonecchia, Italy
2. Member of the National Scientific Committee and Chairperson of Topic IV for the *EUROPACat 2017*, 2017-08-27 - 2017-08-31, Florence, Italy

Torino, January 5, 2017

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