

CURRICULUM VITAE AND TRACK-RECORD

PERSONAL INFORMATION

Armandi Marco:

Date of birth: 09/12/1975

Nationality: Italian

• EDUCATION

2007 PhD in *Materials Science and Technology* @ Politecnico di Torino – Department of Materials Science and Chemical Engineering, Turin, Italy. Thesis title: “*Synthesis and characterization of templated porous carbons as potential materials for hydrogen storage*”. Supervisor: Prof. E. Garrone.

2002 Master Degree in *Industrial Chemistry* @ Facoltà di Scienze Matematiche, Fisiche e Naturali – Università di Torino, Italy

• CURRENT POSITION

2012 – Researcher (RTDa) @ Politecnico di Torino – Department of Applied Science and Technology, Italy

• PREVIOUS POSITIONS

2011 – 2012 Senior Postdoc @ the Centre of Space Human Robotics (CSHR) of the Italian Institute of Technology (IIT), Turin, Italy

2007 – 2011 Postdoc @ the Department of Materials Science and Chemical Engineering, Turin, Italy.

2004 – 2007 PhD Student

2002 – 2004 Fellowship @ Department of Materials Science and Chemical Engineering, Turin, Italy.

• FELLOWSHIPS AND AWARDS

3rd Paper Award @ HysyDays, 1st International Congress of Young Scientist on Hydrogen

• SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

2007 – 2015 Coordination and scientific support to the research activity of 5 PhD Students and 5 Master Students

• TEACHING ACTIVITIES

2013 – 2015 Chemistry course, as regular teacher (professor in charge, 60 hs/year)

2004 – 2010 Chemistry course and Chemistry Lab., as assistant professor (40 hs/year)

• JOURNAL REVIEWER

Microporous and Mesoporous Materials, International Journal of Hydrogen Energy.

• BRIEF DESCRIPTION OF THE SCIENTIFIC PROFILE AND RESEARCH ACHIEVEMENTS

The study of the chemical and chemical-physical foundations of materials such as oxides, microporous and mesoporous systems (e.g. mesoporous silicas, zeolites, template and activate carbons, imogolite nanotubes), of their properties and extent of applications in catalysis and gas adsorption field are my main scientific interests. Born as IR spectroscopist, focusing on the characterization of catalysts surface by means of probe molecule adsorption (Appl Catal B- Environ 2007), I later on deepened the use of this technique by applying the Variable Temperature IR (VT-

IR) Spectroscopy in thermodynamic studies of adsorption processes, e.g. for H₂ adsorption (Int J Hydrogen Energ 2009) or CO₂ capture (ChemPhysChem 2010). Indeed, VT-IR Spectroscopy is a reliable and innovative method to determine both the enthalpy and the standard entropy of adsorption of a given gas-solid interaction. The paramount importance of the porous architecture (both in catalysis and adsorption) of the investigated materials prompted me to deepen the knowledge of the theories underlying experimental techniques such as the Adsorption/desorption of N₂ and H₂ at 77 K and of CO₂ at 273 K. During my studies in the H₂ storage field, I started to collaborate with Prof. M. Santarelli (Dep. of Energy – Politecnico di Torino), whose research activity is linked (inter alia) to the high pressure water electrolysis fed by renewable sources. The collaboration also resulted in the construction of a lab-made system for volumetric measurement of hydrogen adsorption, directly coupled with a high pressure PEM electrolyzer prototype (Int J Hydrogen En 2012).

Recently, I focused on the study of novel catalysts for water oxidation, being interested in both photo- and electro-catalytic elements. My major achievements in this research field are: *i*) the first use of cobalt aluminophosphate CoAPO5 as a water oxidation catalyst was reported (Chem Commun 2012, ACS Catal 2013, PCCP 2015); *ii*) the development of an original model for studying the kinetics of water oxidation as catalysed by Co (Cem Eng J 2013) and Mn (Cem Eng J 2015) oxides in a bubbling reactor.

Very recently, I have undertaken a collaboration with Prof. S. Specchia (Dep. of Applied Science and Technology – Politecnico di Torino) on the study of Met-N-C catalysts (Electrochim Acta 2015) for the oxygen evolution reaction (ORR in Fuel Cells application). This collaboration has the broader aim of developing Non-noble-metals-based catalysts active in both oxygen reduction and evolution reactions.

Technical Skills

During my path to professional growth, I deepened the use of different experimental techniques (all available @ DISAT): FTIR, UV-vis, Raman, X-Ray Photoelectron Spectroscopies; X-Ray Diffraction; Electron Microscopy (FESEM-EDX); ads/des of N₂@ 77K and CO₂ @ 273K; Thermo-Analytical Analysis (TGA-MS; TPDRO); Gas Chromatography and different electrochemical characterization techniques.

• **MAJOR COLLABORATIONS**

- Prof. M. Santarelli (@ DENERG); Prof. S. Specchia, Prof. G. Saracco, Prof. C. Gerbaldi, Prof. E. Tresso (@ DISAT); Prof. F. Pirri (@ DISAT – IIT), Prof. R. Sethi (@ DIATI) – Politecnico di Torino.
- Prof. F. Cavani – Università of Bologna, Italy
- Prof. I. Rossetti – Università di Milano, Italy
- Prof. F. Di Renzo – ENCSM – CNRS Montpellier, France;
- Prof. P. Massiani – Laboratoire de reactivité de Surface – UPMC France
- Prof. CO Arean – University of Balearic Islands, Spain
- Prof. R Ryoo – Center of Functional Nanomaterials @ KAIST; Korea

Top 10 publications:

1. *M. Armandi, B. Bonelli, C. Otero Areán, E. Garrone, Role of microporosity in hydrogen adsorption on templated nanoporous carbons, Micropor Mesopor Mat 112 (2008) 411 – 418. doi:10.1016/j.micromeso.2007.10.017 (cited 42)*
2. *Armandi, B. Bonelli, F. Geobaldo, E. Garrone, Nanoporous carbon materials obtained by sucrose carbonization in the presence of KOH, Micropor Mesopor Mat 132 (2010) 414–420. doi:10.1016/j.micromeso.2010.03.021 (cited 25)*

3. M. Armandi, D. Drago, M. Pagani, B. Bonelli, M. Santarelli, *Direct coupling of H₂ production through a high pressure PEM electrolyzer and its storage by physisorption on microporous material*, *Int J Hydrogen Energ* 37 (2012) 1292-1300. doi:10.1016/j.ijhydene.2011.09.131
4. Zanarini S., Vankova S., Hernandez S., Ijeri V.S., Armandi M., Garrone E., Bonelli B., Onida B., Spinelli P., *CoAPO5 as a water oxidation catalyst and a light sensitizer*, *Chem Commun* 48 (2012) 5754–5756. doi: 10.1039/c2cc17827c
5. M. Armandi, S. Hernandez, S. Vankova, S. Zanarini, B. Bonelli, E. Garrone, *Visible-light driven oxidation of water as catalyzed by Co-APO-5 in the presence of Ru sensitizer*, *ACS Catalysis* 3 (6) (2013) 1272-1278 DOI: 10.1021/cs400067m (cited 7)
6. A. Lamberti, A. Sacco, S. Bianco, D. Manfredi, M. Armandi, M. Quaglio, E. Tresso, C.F. Pirri, *An easy approach for the fabrication of TiO₂ nanotube-based transparent photoanodes for Dye-sensitized Solar Cells*, *Solar Energy* 95 (2013) 90-98 DOI: 10.1016/j.solener.2013.06.004
7. S. Hernández, S. Bensaid, M. Armandi, A. Sacco, A. Chiodoni, B. Bonelli, E. Garrone, C.F. Pirri, G. Saracco, *A new method for studying activity and reaction kinetics of photocatalytic water oxidation systems using a bubbling reactor*, *Chem Eng J* 238 (2103) 17-26 DOI: 10.1016/j.cej.2013.08.094
8. M. Piumetti, F.S. Freyria, M. Armandi, F. Geobaldo, E. Garrone, B. Bonelli, *Fe- and V-doped mesoporous titania prepared by direct synthesis: Characterization and role in the oxidation of AO7 by H₂O₂ in the dark*, *Catal Today* 227 (2014) 71-79 DOI: 10.1016/j.cattod.2013.11.013
9. Ottone C., Armandi M., Hernández S., Bensaid S., Fontana M, Pirri C.F., Saracco G., Garrone E., Bonelli B., *Effect of surface area on the rate of photocatalytic water oxidation as promoted by different manganese oxides*, *Chem Eng J* (2015) In Press, <http://dx.doi.org/10.1016/j.cej.2015.01.014>
10. Monteverde A.H., Osmieri L., Armandi M., Specchia S., *Varying the morphology of Fe-N-C electrocatalysts by templating Iron Phthalocyanine precursor with different porous SiO₂ to promote the Oxygen Reduction Reaction*, *Electrochim Acta* (2015) In Press doi:10.1016/j.electacta.2015.01.165