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CURRICULUM VITAE ET STUDIORUM: PROF. Marco Borsari

Personal data: Born in Nonantola (MO), 18/8/1961
Present Position: Associate Professor Physical Chemistry
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EDUCATION

- **December 1985** Degree in Chemistry (summa cum laude) at the University of Modena with a thesis entitled 'Comportamento Elettrochimico di Dansil- e Tosil- aminoacidi', under the supervision of Prof. Giovanna Gavioli
- **February 1992** Ph. D. in Chemistry at Consorzio Parma, Modena e Ferrara under the supervision of Prof. Giovanna Gavioli
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PREVIOUS POSITIONS AND FELLOSHIPS

- **From June 1992 to June 2003.** Researcher at University of Modena
- **From June 2003 to -.** Associate Professor at University of Modena

BRIEF DESCRIPTION OF THE RESEARCH ACTIVITY

The scientific activity of Marco Borsari is mainly devoted to the molecular electrochemistry and bioelectrochemistry, in particular to the investigation of the redox and functional properties of electron transfer proteins and redox enzymes. He improved experimental techniques to direct (through suitable functionalized surfaces) and spectroelectrochemical characterization of the electron transfer properties of biopolymers. He gained experience in the characterization of the redox properties of cytochromes , blue copper proteins, iron-sulfur proteins, superoxide-dismutases and peroxidases. He investigate topics joined to the analysis of the redox thermodynamic parameters to understand the molecular determinants of the E°' value and to characterize the aspects of the chemistry of these proteins in solution.
This problem is tackled with a thermodynamic approach by analysis of the enthalpic and entropic contributions to the free energy change involved in the electron transfer process and trying to correlate them to:
- the features of the first coordination sphere of the metal center
- the inherent coordinative properties of the metal site
- the electrostatic interactions of the metal center with the protein matrix and the solvent
- the general ionic strength effects and specific protein-ion binding
- the differences in protein flexibility and solvation properties of the two redox states.

Site-directed mutagenesis is exploited to create suitable protein variants to probe for the above effects and computational techniques are used to analyze the changes induced by the point mutation in molecular properties. The objective is the definition of quantitative relationships between the alteration in molecular properties induced by point mutations and variation of the thermodynamic parameters measured electrochemically. This quantitative structure-property relationships (QSPR) approach would in principle allow attainment of models for the rationalization and interpretation of the observed behaviors on molecular bases, with good predictive ability.
Fields of interest are:

- the properties of monolayers formed by cytochromes and cupredoxins immobilized on SAMs and comparison of the reactivity (reduction potential, electron transfer efficiency, conformational equilibria and catalytic properties) with that of the corresponding free diffusing protein. This information is a necessary step for the rational design of ET protein-based bio-molecular devices;
- the thermodynamic influence of solvent reorganization within the hydration sphere of ET metallo-proteins, associated with enthalpy/entropy compensation phenomena;
- the molecular factors that control the thermodynamics of conformational equilibria in ET metalloproteins involving changes in metal coordination, with particular reference to the alkaline transition in mitochondrial and bacterial cytochromes *c* and the acid transition in blue copper proteins;
- the determinants of the reduction potential of redox metalloenzymes (such as plant peroxidases or multi-copper oxidases).

Marco Borsari currently collaborates with several italian and foreign scientists.

MAJOR COLLABORATIONS

Prof. Christian Amatore (CNRS & Ecole Normale Superieure, PSL, Sorbonne University, Paris, France)

Prof. P. Hildebrandt (Institut für Chemie, Technische Universität Berlin, Berlin, Germany)

Prof. C. Dennison (Institute for Cell and Molecular Biosciences, Newcastle University, UK)

Prof. C. Gooijer (Laser Centre, Vrije Universiteit, Amsterdam, The Netherlands)

Prof. J. Cowan (Department of Chemistry, The Ohio State University, Columbus, USA)

Prof. F. del Monte (Department of Medicine, Medical University of South Carolina, Charleston, USA)

Dr. I.C. Sainz-Diaz (Instituto Andaluz de Ciencias de la Tierra (CSIC-UGR), Granada, Spain)

Dr. A. Serrano (Instituto de Cerámica y Vidrio (ICV), Madrid, Spain)

Dr. G.R. Castro (Spain[c] SpLine, ESRF, Grenoble, France)

Prof. A. Amadei (Dipartimento di Scienze Chimiche, Università di Roma “Tor Vergata”)

Dr C. Tavagnacco (Dip. Scienze Chimiche, Università di Trieste)

Prof. C. Luchinat (Dip. Chimica, Università di Firenze)

Prof. G. Farinola (Dip. Chimica, Università di Bari)

Dr. D. Malferrari (Dip. Scienze Chmiche e Geologiche, Università di Modena e Reggio Emilia)

ACADEMIC DUTIES

- President of the Commissione Paritetica Docenti-Studenti (CP-DS)

MEMBERSHIPS AND APPOINTMENTS

- Member of the Doctorate School 'MODELS AND METHODS FOR MATERIAL AND ENVIRONMENTAL SCIENCES - DOT1317874' of the University of Modena and Reggio Emilia (from the academic years 2014/2015 to -)
- Member of IUPAC Commission: *Chemical and Biochemical Thermodynamics Reunification*, Chair: Prof. Stefano Iotti (University of Bologna).

ACTIVITIES IN REFERRED SCIENTIFIC JOURNALS.

J. Am Chem. Soc., J. Phys. Chem. B and C, Phys. Chem. Chem. Phys., Chem. Comm., Biochim. Biophys. Acta., Electrochim. Acta, Bioelectrochemistry, Sensors and Actuators B, J. Biol. Inorg. Chem., Eur. J. Inorg. Chem., J. Electroanal. Chem., J. New Mat. for Electrochem. Sys., Life Science, Langmuir, Chemelectrochem, New Journal of Chemistry, Nanoscale.

SCIENTIFIC PUBLICATIONS: http://personale.unimore.it/rubrica/pubblicazioni/borsari