

## PERSONAL INFORMATION

Marco Zannotti

JOB APPLIED FOR  
POSITION  
PREFERRED JOB  
STUDIES APPLIED FOR

Research And Development

## WORK EXPERIENCE

11/01/2014 – 10/07/2014

## Visiting Researcher

University of Nottingham, School of Inorganic Chemistry, E. A. Gibson research group

- Optimization, production, study and characterization of p-type Solar Cells for their use in Tandem Solar Cell devices

01/07/2015 – in progress

## Post-doc Research Fellow

University of Camerino, School of Science and Technology, Chemistry Division, Giovannetti and Ferraro research group

- Solar cells, water depuration by photocatalysis, graphene production.

EDUCATION AND TRAINING  
PERSONAL SKILLS

19/03/2012 – 19/03/2015	<b>Ph.D. in “Chemical And Pharmaceutical Sciences And Biotechnology : Chemical Sciences”</b>	
Università Degli Studi di Camerino – School Of Science And Technology – Chemistry Division Ph.D. Thesis : “Analytical approach to technologies for the environment: from wastewater aeration to energy production”		
<ul style="list-style-type: none"> <li>▪ Aeration process</li> <li>▪ Adsorption and kinetic studies</li> <li>▪ Preparation of nanomaterials and their electrochemical characterization</li> <li>▪ Optimization of DSSCs and their characterization</li> </ul>		
15/12/2008 – 13/04/2011	<b>Master Degree in Chemistry And Advanced Chemical Methodologies (Classe 62/S)</b>	
Università Degli Studi di Camerino – School Of Science And Technology – Environmental Chemistry		
Master Degree Thesis : “ Ottimizzazione dell’assorbimento di coloranti porfirinici su film nanoconduttori: uno studio cinetico e di equilibrio.”		
Final Mark: 110/110 with honors		
<ul style="list-style-type: none"> <li>▪ Uv-vis characterization</li> <li>▪ Adsorption and kinetic studies</li> </ul>		
6/10/2006 – 15/12/2008	<b>Bachelor Degree in Chemistry (Classe 21)</b>	
Università Degli Studi di Camerino – School Of Science And Technology – Chemistry Division		
Bachelor Degree Thesis : “Studio delle proprietà coordinative di leganti precarbenici derivati da liquidi ionici a base di imidazoli e triazoli N-alchilati		
Final Mark: 110/110 with honors		
<ul style="list-style-type: none"> <li>▪ Inorganic Synthesis</li> <li>▪ Coordination Chemistry</li> </ul>		
2001-2005	<b>Diploma di Maturità Scientifica</b>	
Liceo Scientifico V.Volterra Fabriano- Final Mark : 100/100		

Mother tongue(s) Italian

Other language(s)

UNDERSTANDING		SPEAKING		WRITING
Listening	Reading	Spoken interaction	Spoken production	

English	C1	C1	C1	C1	C1
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Levels: A1/2: Basic user - B1/2: Independent user - C1/2 Proficient user  
 Common European Framework of Reference for Languages

**Communication skills** ▪ Good communication skills gained through my experience in the laboratory teams at University of Nottingham and Camerino;

**Organisational / managerial skills** ▪ Good work planning ;  
 ▪ Prone to teamwork and cooperation;  
 ▪ Analytical and methodical approach ;

**Job-related skills** ▪ Experience in nanocomposite synthesis ;  
 ▪ Experience in oxygenation for wastewater depuration;  
 ▪ Experience in production, characterization and optimization of Dye Sensitised Solar Cells;  
 ▪ Experience in Photo-catalysis by TiO<sub>2</sub>;  
 ▪ Good Knowledge of the following characterization techniques :  
     - UV-vis Spectrophotometry;  
     - Fluorescence Spectrophotometry.  
     - Scanning Electron Microscopy;  
     - ICP-MS ;  
     - Gas Chromatography;  
     - X-Ray Diffraction ;  
     - Solar Simulator and charge studies for Solar Cells;  
     - Morphological Analysis ;  
     - BET  
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**Computer skills** ▪ Good knowledge on Windows® Operating System;  
 ▪ Good knowledge of Origin Software.

**Other skills** ▪ Amateur football player ;  
 ▪ Runner;

**Driving licence** ▪ B  
 ▪ Equipped with Passport

ADDITIONAL INFORMATION

- Publications
- Presentations
- Projects
- Conferences
- Seminars
- Honours and awards
- Memberships
- References

## Publications

- R. Giovannetti, **M. Zannotti**, L. Alibabaei, and S. Ferraro, *International Journal of Photoenergy*, 2014; Vol. 1; Pages:1 -9 **Equilibrium and kinetic aspects in the sensitization of monolayer transparent TiO<sub>2</sub> thin films with porphyrin dyes for DSSC applications**

### Abstract

Free base, Cu(II) and Zn(II) complexes of the 2,7,12,17-tetrapropionic acid of 3,8,13,18-tetramethyl-21H,23H porphyrin (CPI) in solution and bounded to transparent monolayer TiO<sub>2</sub> nanoparticle films were studied to determine their adsorption on TiO<sub>2</sub> surface, to measure the adsorption kinetics and isotherms, and to use the results obtained to optimize the preparation of DSSC photovoltaic cells. Adsorption studies were carried out on monolayer transparent TiO<sub>2</sub> films of a known thickness. Langmuir and Freundlich adsorption constants of CPI-dyes on TiO<sub>2</sub> monolayer surface have been calculated as a function of the equilibrium concentrations in the solutions. The amount of these adsorbed dyes showed the accordance with Langmuir isotherm. Kinetic data on the adsorption of dyes showed significantly better fits to pseudo-first-order model and the evaluated rate constants linearly increased with the grow of initial dye concentrations. The stoichiometry of the adsorption of CPI-dyes into TiO<sub>2</sub> and the influence of presence of coadsorbent (chenodeoxycholic acid) have been established. The DSSC obtained in the similar conditions showed that the best efficiency can be obtained in the absence of coadsorbent with short and established immersion times.

- R. Giovannetti, L. Alibabaei, **M. Zannotti**, S. Ferraro, L. Petetta, *The Scientific Journal*; 2013; Vol. 1; Pages:1 -9 **"HPLC-DAD-ESI/MS Identification of Light Harvesting and Light Screening Pigments in the Lake Sediments at Edmonson Point"**

### Abstract

The composition of sedimentary pigments in the Antarctic lake at Edmonson Point has been investigated and compared with the aim to provide a useful analytical method for pigments separation and identification, providing reference data for future assessment of possible changes in environmental conditions. Reversed phase high performance liquid chromatography (HPLC) with electrospray-mass spectrometry (ESI-MS) detection and diode array detection (DAD) has been used to identify light screening and light harvesting pigments. The results are discussed in terms of local environmental conditions.

- **M. Zannotti**, R. Giovannetti, *Journal of Molecular Liquids*, **Kinetic evidence for the effect of salts on the oxygen solubility using laboratory prototype aeration system.** [Accepted, in print]

### Abstract

This study is dedicated to an accurate evaluation of thermodynamic and kinetics aspects in the oxygenation process of water/salt solutions. Oxygenation has been analysed by means of kinetic study of oxygen dissolution from the oxygen mass transfer coefficient (K<sub>L</sub>a) and oxygen transfer rate (SOTR). A stirred, submerged aerated 4-liters system has been designed and the operational conditions have been optimized by studying the influence of hydraulic head, air flow and salinity of water using an optical oxygen sensor. Concerning the thermodynamic phase equilibria, experimental and modelling results are obtained from different binary systems (water/air) and ternary systems (water/air/salts). These information are necessary to predict the composition of the gas phase during the process and are also important for an implementation in a process simulation. The oxygen mass transfer coefficients were firstly measured, by monitoring in the time the oxygen concentration in various synthetic liquid phases containing different salts (NaCl, KCl, LiCl). When compared to clean water, noticeable increase of K<sub>L</sub>a was observed; the variation of K<sub>L</sub>a and SOTR with the solution salinity was modelled and found dependent on the nature of cation in the salt added. For all cases, an increase of K<sub>L</sub>a with increasing salinity was observed but, when the results are correlated with salt molar concentration, very important relation attributed to different salts has been obtained. The present study clearly confirmed the importance to define the experimental conditions before to describe and to model appropriately the gas-liquid mass transfer phenomena.

- **M. Zannotti**, R. Giovannetti, C.A. D'Amato, E. Rommozzi, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, **Spectroscopic studies of porphyrin functionalized multiwalled carbon nanotubes and their interaction with TiO<sub>2</sub> nanoparticle surface.**

UV-vis and fluorescence investigations about the non-covalently interaction, in ethanolic solutions, of multi wall carbon nanotube (MWCNT) with Coproporphyrin-I, and its Cu(II) and Zn(II) complexes (MCPIs) have been reported.

Evidence of binding between MWCNTs and porphyrins was discovered from spectral adsorption decrease respect to free porphyrins and by the exhibition of photoluminescence quenching with respect to free porphyrins demonstrating that MWCNT@MCPIs are potential donor-acceptor complexes. Equilibrium and kinetic aspects in the interactions with monolayer transparent TiO<sub>2</sub> thin films with the obtained MWCNT@MCPIs are clarified showing their effective adsorption by porphyrin links on the TiO<sub>2</sub> monolayer support, with respect to only MWCNTs, according to the Langmuir model and with pseudo first-order kinetics.

Morphological description of the adsorption of MWCNT@MCPIs on TiO<sub>2</sub> with scanning electron microscopy has been reported. The obtained experimental evidences describe therefore MWCNT@MCPIs as potential sensitizers in the DSSC (Dye-Sensitized Solar Cell) applications.

### Presentations

Speaker at **Salone Europeo della Ricerca di Trieste** (26-28 September 2014) with the talk : **MASSIMIZZARE L'ENERGIA ACQUISITA DA NANOPARTICELLE:SOLE, COLORE E NANOMATERIALI = ENERGIA.**

### Conferences

**ISOC 2013**, 30 August-3 September 2013, Camerino (MC), Italy. **Sensitization of monolayer transparent TiO<sub>2</sub> thin films with metal-porphyrin dyes for DSSC applications. Equilibrium and kinetic aspects.** M. Zannotti, C. A. D'Amato, R. Giovannetti.

**International Conference on Diamond and Carbon Materials**, 2-5 September 2013, Riva del Garda (TN), Italy. **Interaction of Porphyrins with Carbon Nanotubes**, M. Zannotti, R. Giovannetti, R. Gunnella, L. Petetta, S. Ferraro.

**XXIV Analytical Chemistry Congress of Italian Chemical Society**, 15-19 September, Sestri Levante (GE), Italy. **Oxygen transfer in a gas-liquid system : kinetic influence of water salinity**, M. Zannotti, R. Giovannetti, S. Ferraro, S. Piccinini ISBN 9788890767012.

**FNMA '14**, 1-5 September, Camerino (MC), Italy. **Porphyrins functionalized MWCNTs and their interaction with TiO<sub>2</sub> nanoparticles surface.**  
R. Giovannetti, M. Zannotti, C. A. D'Amato, E. Rommozzi, S. Ferraro  
ISBN 978-83-937979-0-5.

**FNMA '14**, 1-5 September, Camerino (MC), Italy. **Characterization and environmental application of Polypropylene coated nano-TiO<sub>2</sub> in wastewaters**  
A. D'Amato, E. Rommozzi, M. Zannotti, M. Minicucci, R. Gunnella  
R. Giovannetti, C. A. D'Amato, E. Rommozzi, S. Ferraro  
ISBN 978-83-937979-0-5.

**4th Scientific Day of the School of Science and Technology**, 11 June 2014, Camerino (MC) Italy, **Optimization of Photocathode for Tandem-Dye Solar Cell**  
M. Zannotti, E. Gibson, R. Giovannetti, C. Wood, G. Summers  
ISBN: 9788867680177.

**SPEA 8, 8th European Meeting on Solar chemistry and Photocatalysis: environmental application**, 25-28 June 2014, Thessaloniki, Greece. **Visible light photoactivity of polypropylene coted Nano-TiO<sub>2</sub> for dyes degradation**,  
Rommozzi, M. Zannotti, R. Giovannetti. C. A. D'amato, E.

**SPEA 8, 8th European Meeting on Solar chemistry and Photocatalysis: environmental application**, 25-28 June 2014, Thessaloniki, Greece. **Model of photocatalytic Degradation of Alizarin Red-S Polypropylene coated nano-TiO<sub>2</sub>**,  
A. D'amato, E. Rommozzi, M. Zannotti, R. Giovannetti, S. Ferraro. C.

### Seminars

**"FREE HPLC/UHPLC Method Development Seminar"**, Phenomenex; Bologna 11th October 2011.

**"Web Training@Unicam2012"**, University of Camerino, Camerino, 16-17-19-20 July, 2012.

**"English for writing research papers"**, University of Camerino, Camerino, 18-19-20 June, 2012.

**"Communication of science to public", part 2 – how to write a scientific article for the general public**, University of Camerino, 28<sup>th</sup> June.

**Co-supervisor**

*Co-Supervisor of Master Degree's thesis entitled: Optimization of Photocatalytic reactor for dyes degradation using PP coated Nano-TiO<sub>2</sub>, 17th October 2013, Università di Camerino.*

*Co-Supervisor of Master Degree's thesis entitled: Kinetic Model for Photocatalytic Degradation of Alizarin-Red S by PP coated nano-TiO<sub>2</sub>, 11th April 2014, Università di Camerino.*

**Teaching assignments**

**Academic Year 2014-2015 - ENVIROMENTAL CHEMISTRY CHIM/12 – Geoenviromental resources and risks 30 hours- 3CFU**

ANNEXES

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