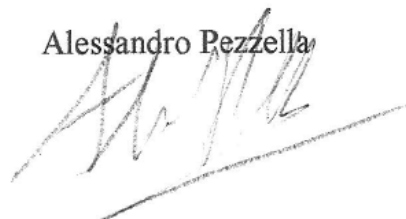


Naples 11/2013

Alessandro Pezzella



Sections:

1. Basic information
2. Research and scientific activities
3. Teaching and supervision
4. Administration and other activities

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1) Basic Information:

Age: 44

Title: PhD in Chemistry	(1997)
Master (5 ys.) degree in Chemistry	(1993) cum laude
Master (5 ys.) degree in Pharmacy	(1999)
Master (4 ys.) degree in Mathematics	(2004) cum laude

Occupation:

Actual permanent position: Researcher at the University of Naples Federico II 2000 - present

Visiting Scientist:	Daresbury Synchrotron Laboratory of CCRC (Council for the Central	
	Laboratory of the Research Councils, UK)	(2005-2007)
	Lund Laser Centre (LLC) - Lund, Se.	(2007-2011)

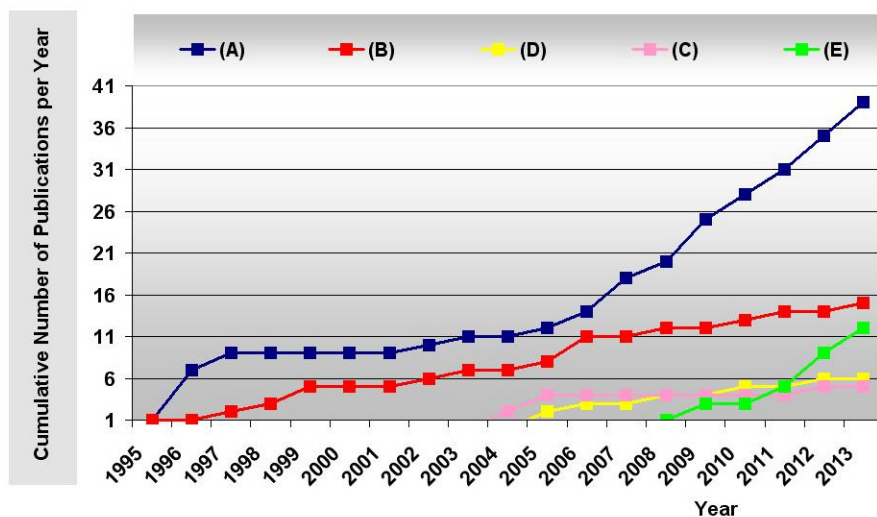
Governance Responsibilities:	Science Faculty board:	2004 – 2010
	Academic board of Federico II:	2008 – present
	Italian University Council:	2011 – present

2) Research and scientific activities

My research activity settles in the frame of oxidative chemistry of organic compounds (chiefly natural products). In this frame two main themes date from the beginning of my activity in the laboratory directed by Prof. Protá and concern: the melanin pigment investigation (A) and the oxidative behaviour of catecholamine neurotransmitters (B); two other themes, the investigation of oxidative chemistry of steroids (C) and the development of synthetic routes based on the oxidative transformation of aromatic systems (D), have been introduced in the laboratory activity following my inputs. More recently, starting from a collaboration with the STMicronics, I started undertaking research projects on the applications of bioinspired polymers and heterocyclic compounds in organic-based electronic and optoelectronic devices, including the investigation melanin bioelectronics (E). According to this sorting of the research themes a graphical summary of peer review published papers is possible and reported below.

In the graph a time course plot of peer reviewed publications in the lines (A)-(E) above defined.

Following a brief report on research activity. The report does not intend to present a detailed description of research themes, it is just an highlight of the main results obtained in lines A)-E).



Main insights arising from my research activity on melanins (A) concern the following issues:

- 1) Investigation of the eumelanin backbone: structural elements and mechanism(s) of build up;
- 2) Insights in the spectroscopic and photophysical properties of eumelanins and their precursors.

Issue 1) is related to the long lasting topic of the eumelanin structure. In Tetrahedron 1997 I tried the first design and implementation of an access strategy to tetramers and higher oligomers of 5,6-dihydroxyindoles. The approach relies on the oxidation of 5,6-dihydroxyindole dimers; on this ground several studies followed, allowing a detailed definition of basic structural motifs in the pigment backbone and disclosure of unexpected positional coupling reactivity.

In this frame, a series of studies addressing early steps of 5,6-dihydroxyindoles oxidation were conducted in the Daresbury Synchrotron Laboratory in collaboration with Prof. Land providing evidences of the quinonoid nature of the intermediates in the oxidative polymerization of 5,6-dihydroxyindoles and their oligomers. On the base of these and other studies I recently proposed an investigation of the late steps of 5,6-dihydroxyindole oxidative polymerization allowing the unveil of the dynamics of the aggregation process before pigment precipitation.

Issue 2) is addressed in a series of papers in part in collaboration with the group directed by Prof. Sundström at the Lund University. The first study investigated the photophysics of eumelanins in order to elucidate potential mechanisms of photoprotection. In this my role has been in the proposal, revealed expedient, to not directly address the pigments, but to model these with their monomer precursors and oligomers (some more papers are in progress). Measures were conducted during my stay in Lund, data collected allowed the definition of a picture of the energy dissipative mechanisms in UV light exposure.

A parallel set of studies is related to the disentangling of eumelanin spectroscopic feature. This issue is one of the most critical in eumelanin research and a long lasting problem. Following my plan two approaches were developed in collaboration with two groups in the Faculty of Science and the Polytechnic in Naples, allowing, for the first time, to get a water soluble eumelanin pigment. The approaches developed also furnished the basis for a further photophysical investigation comparing behaviour of monomers, oligomers and pigment under homogeneous conditions.

Basing on the experience from studies in line **B**) and following the pharmacy studies I extended the investigation of the “chemistry of the oxidative stress” under conditions of relevance to biological environments to steroid species belonging to the neuro-steroids. A series of results came out furnishing a complete scenario of estradiol reactivity and the first evidence of possible paths for endogenous generation and transformation of the cytotoxic catecholestrogens.

Line **D**) collects a series of synthetic approaches basing on the oxidative reactivity of aromatic systems. Main achievements are represented by the development of procedures for the preparation of labile species and/or the simplification of multistep procedure, most important is the expedient entry to labile catechol derivatives.

Spurred by the need of valuable availability of eumelanin precursors and basing on the Sonogashira reaction a unifying synthetic strategy for the entire collection of known oligomers of 5,6-dihydroxyindole has been obtained. Also synthetic routes for thio- and iodo-derivatives were achieved for the first time furnishing, beyond general synthetic strategies, tools for 5,6-dihydroxyindole reactivity investigation.

On the whole, these studies furnished ideas and material for the undertaking of line **E**) activities I started in recent years opening collaborations with some groups in Italy and abroad. At moment we got the first eumelanin film deposition by MAPLE technology (*JAP*, 2011) and the development of eumelanin and heparin based hybrid materials: TiO₂ nanoparticles (*MSE-c*, 2012); porous silicon (*NRL*, 2012); SiO₂ Nanoparticles (*MSE-c*, 2012).

Of particular relevance in this context is the disclosing of the interaction between eumelanin and gold which points to new opportunities for the fabrication of eumelanin-gold nanostructures and biocompatible memory devices and should be taken into account in the design of devices based on eumelanin thin films. Evolution of eumelanin redox states detected by an organic electrochemical transistor (OECT) was addressed proposing for the first time OECT as characterization tool en route to bioelectronics and biosensing. A book chapter collecting relevant studies on eumelanin in organic electronics was published with Wiley (*Alessandro Pezzella, Julia Wünsche (2013) Eumelanin: an old natural pigment – a new material for organic electronics. Chemical, physical, and structural properties in relation to potential applications.. In Organic Electronics: Emerging Concepts and Technologies*).

- In the frame of eumelanin organic electronics studies, a grant application is under review within the « Quebec Programme de soutien à la recherche, volet Soutien à des initiatives internationales de recherche et d'innovation (PSR-SIIRI) ».
- A Marie Curie action (Novel conducting polymer composites for applications in medicine) within the FP7 People Programme (IRSES) was founded in 2013 (122 K€).
- Heparin based hybrid material investigation opened the access, in collaboration with GVS Sud, to the MISE peer reviewed grant n. E10/000798/02/X (2010-2013, 787 K€) for design and production of heparin requesting nanostructured devices for biomedical applications.
- In collaboration with the INFN an investigation is in progress to set up doping protocols for organic thin films, basing on ion implantation (*NIM-b*, 2012).
- Within a two year research project (2007-2009, 50 K€) founded by STMicroelectronics, beyond several publications, a protocol developed in the general frame of electric bistable molecules study was object of international patent (*US7842826-2010*).

2.1) Publications & Citations:

75 refereed articles:

34 in the last 5 years (additional 2 in review) in high rank journals including: JACS, Ang Chemie, JOC, J. Med. Chem., Pigment Cell & Melanoma Research, J Phys Chem B;

22 as corresponding author (1, JACS; 1, Biomacromolecules; 4, JOC; 1, Journal of Materials Chemistry B; 1 Chem. Res. Toxicol.; 1, J. Phys. Chem. (B); 1, Tetrahedron Asymmetry; 3, Tetrahedron Letters; 2, Tetrahedron; 2, Steroids; 3, Photochem. Photobiol.; 1, NIM B);

25 as first or last author.

H index: 21 (Scopus)

> 1230 citations, > 180 in 2013 (Scopus);

Scientific Indicators defined in the National Scientific Qualification (NSQ) Call (art.16 of the law 30 December 2010, n.240 and following Legislative Decrees)

Published Journal Papers since 2003	Academic age normalized citations **	Contemporary H-index ***
60 (59)*	64,78 ^{a)}	13

* Scopus Data at 11/2013

** a) age in years, 19

*** 15 papers with citation index 13

Further information:

- International Standing: numerous talks at major national and international conferences and workshops, particularly in the area of melanin physics and chemistry including the XIX IPCC CONFERENCE, 2005. Reston, VA, USA; and the XXI IPCC CONFERENCE, 2011, Bordeaux, France (<http://www.ifpcs.org/>) and the 2012 Spring EMRS Symposium on Biological applications for organic electronic devices (<http://www.emrs-strasbourg.com/index.php>)
- Reviewing: Reviewer for numerous international journals (JOC, Tetrahedron, JACS, J Phys Chem B, etc.); Registered in the European Commission experts database for the research framework programmes (one project evaluated over the last two years for 2 M€).

3. Teaching and supervision

Teaching Duties-

Undergraduate: Organic Chemistry; Organic Chemistry Laboratory; Chemistry of Heterocyclic Compounds.

Graduate (PhD): The application of Polya's theorem to isomer counting.

Supervision duties-

Graduate and PhD thesis; STMicronics funded fellowship

Internal and external master and PhD thesis evaluator.

4. Administration and other activities

- Member of the Natural Science Faculty board of the University of Naples "Federico II" (Giunta di Facoltà) 2004 - 2010;
- Member of the "Federico II" academic board (Senato Accademico) 2008- present;
- Member of the Italian National University Council (Consiglio Universitario Nazionale), 2011 - present.