

# Alessia Colombo

## CURRICULUM VITAE

### PERSONAL INFORMATIONS

SURNAME	COLOMBO
NAME	ALESSIA
DATE OF BIRTH	20/07/1979

### EDUCATION AND TRAINING

---

#### October 1998-July 2003

Graduation in Chemistry (Mark: 110/110)

University of Milan

Title: "*Sintesi di 2-amminoadenosine, intermedi per la preparazione di guanosine modificate nella porzione ribosidica*" (Tutor: Prof. E. Santaniello)

#### November 2003

Achievement of the qualification to exercise the profession of Chemist

#### 9 Dicembre 2008

PhD in Industrial Chemistry (XXI ciclo)

University of Milan

Title: "*Stereoselective syntheses of nitrogen-containing chiral molecules for specific interactions with biological targets.*" (Tutor: Prof. G. Lesma)

### ACADEMIC CAREER

---

A. Colombo carried out her research activity at the Chemistry Department of the University of Milan initially (2004-2008) dealing with the synthesis of biologically active organic molecules and subsequently (2008-today) of molecular materials for optoelectronics , in particular for solar cells and luminescent devices with the ambitious aim of ensuring sustainable growth and development through the use of alternative energies.

From **2004 to 2005** she worked in the laboratories of Prof. B. Danieli initially with a scholarship for Miat Spa (1/09 / 2004-31 / 01/2005) and later for Sanofi-Aventis (1/02 / 2005-31) / 12/2005) under the supervision of Prof. G. Lesma. In the three-year period 2005-2008 she was a PhD student in Industrial Chemistry (XXI cycle, tutor: Prof. G. Lesma) and on 9 December 2008 she obtained the title of PhD in Industrial Chemistry, discussing a thesis entitled: "*Stereoselective syntheses of nitrogen-containing chiral molecules for specific interactions with biological targets.*"

Since 2008 you have collaborated with Prof. D. Roberto and Prof. R. Ugo:

In November 2008 she was a fellow of the National Interuniversity Consortium for Materials Science and Technology (INSTM) dealing with "Synthesis and characterization of organometallic compounds with potential application in non-linear optics and in solar cells" then from December 2008 to January 2010 she was research fellow initially with a project funded by the Cariplo Foundation (2007) entitled: "Synthesis of organometallic complexes for potential application in WOLEDs" and later with a project funded by the Cariplo Foundation (2008) entitled: "New organometallic materials for applications in solar cells. The research activity mainly concerned the design, synthesis and characterization of organic compounds and related organometallic complexes for applications in White-Organic Light-Emitting Diodes (WOLED) devices, in non-linear optics (NLO) and in solar cells. .

From February 2010 to November 2013 she was the holder of a TYPE A Post-Doc research grant from the University of Milan with a project entitled: "*Synthesis of new organometallic photosensitizers as materials for applications in photovoltaic solar cells*" of which Prof. D. Roberto was scientific director. As part of this

topic, A. Colombo worked on the preparation of coordination compounds to be used as photosensitizers in dye-sensitized solar cells (DSSCs) or as donors in Bulk-HeteroJunction (BHJ) solar cells.

In 2010-2011 she was invited to participate in the COST D35 network, which brings together researchers from the UK, France, Italy, Germany and the Czech Republic involved in the project: "*Multifunctional organometallic chromophores for light emitting devices and luminescent sensor.*"

From **December 2013** to **May 2016** she was the holder of a research grant from the University of Milan with a project entitled "New metal complexes for solar cells" of which she is scientific director Prof. C. Dragonetti. The research activity mainly concerned the synthesis of organic ligands and related copper complexes to be used as dye or as redox mediators in DSSC type solar cells.

From **1 October 2016** to **27 December 2018** she was a researcher of TYPE A (S.S.D. CHIM / 03, S.C. 03 / B1) at the Department of Chemistry of the University of Milan.

From **28 December 2018** to **27 December 2021** she was a researcher of TYPE B (S.S.D. CHIM / 03, S.C. 03 / B1) at the Department of Chemistry of the University of Milan.

From **28 December 2021** she is Associate Professor (S.S.D. CHIM / 03, S.C. 03 / B1) at the Department of Chemistry of the University of Milan.

## RESEARCH ACTIVITY

---

A. Colombo began his research activity in the field of "Medicinal Chemistry" synthesizing new polyfunctionalized chiral synthons as key intermediate for the enantioselective synthesis of azasugars with anticancer properties.

She was then attracted by the field of Molecular materials for photonics and electronics, giving rapidly an important contribution in **three sectors**:

**(1) Synthesis and characterization of coordination compounds with nonlinear optical properties (NLO) and their nanoorganization.**

Her studies have allowed to identify new coordination compounds characterized by a second order NLO response (evaluated by the EFISH-Electric Field Induced Second Harmonic generation technique) high and in some cases switchable, clarifying at the same time the electronic factors that modulate the increase of the NLO response in metal complexes with  $\pi$ -delocalized nitrogen donor ligands. Another area of interest is the nanoorganization of molecular compounds with significant NLO properties to give new nanostructured materials stable over time and with improved properties compared to molecular ones, in particular she studied the orientation under electric poling and blocking by means of covalent bonds of NLO active functionalized chromophores in a polymeric system.

**(2) Synthesis, photophysical and spectroscopic characterization of compounds with luminescent properties aimed at sustainable development.**

Prof. A. Colombo also devoted herself to the synthesis and characterization of new complexes of Pt (II) and Iridium (III) useful for the preparation of luminescent devices. An emerging field, as regards the N ^ C ^ N complexes of Pt (II), is their use as luminescent tracers for bio-imaging; in this context A. Colombo developed cyclometallated platinum compounds with great cellular permeability and low cytotoxicity.

**(3) Synthesis and characterization of organic or coordination compounds for application in solar cells.**

One of the main open challenges is to replace fossil fuels with renewable energy sources: this can be done in a "clean" way by directly exploiting the energy of the sun through photovoltaic technologies. In this context, the BHJ and DSSC solar cells are currently of great interest. Therefore, A. Colombo in recent years has been dedicated to the design, synthesis and study of new coordination compounds for application in both BHJ and DSSC type solar cells.

In particular, she actively collaborates with the Research Center for Non-Conventional Energy, ENI Donegani Institute in the synthesis of new Cu (I)-based dyes of great interest for low-cost DSSCs, subject to an Italian Patent (MI2013A000149). Always with a view to identifying cheaper materials and with improved properties to be used in cells, she has recently also dealt with the synthesis and study of copper (I) and

copper (II) complexes with distorted tetragonal geometry to be used as redox mediators instead of the classic iodide / triiodide redox couple. Then by combining a copper (I) dye and a Cu (I) / (II) redox mediator she reported the **first example of "full-copper" DSSC**.

Still in the field of renewable energy, she is also involved in the synthesis and characterization of variously functionalized perylene derivatives for application as luminophores in luminescent solar concentrators (LSC), a work carried out in collaboration with the Politecnico di Milano.

---

### PUBLICATIONS AND BIBLIOMETRIC DATA

---

A. Colombo is author of more than **90 publications** (22 as first author and 21 as corresponding author) on highly qualified international journals, **3** patents (2 nationals and 1 european) and **65** communications at national and international congresses, **1** invited seminar and **1** Planary Lecture.

Link for updated bibliometric data (da Scopus):

<http://www.scopus.com/authid/detail.uri?authorId=7202937269>

Scopus Author ID: 7202937269; ORCID: 0000-0001-8004-3200; Researcher ID: Q-4413-2016

---

### MEMBER OF EDITORIAL BOARD

---

2017-2018: Guest Editor for "Inorganics" for the Special Issue "Metal Complexes as Non Linear Optical Molecular Materials" (MDPI)

2019-2021 Guest Editor for "Molecules" (ISSN 1420-3049) for Special Issue "Recent Advances in Dye-Sensitized Solar Cells" [https://www.mdpi.com/journal/molecules/special\\_issues/Dye-Sensitized](https://www.mdpi.com/journal/molecules/special_issues/Dye-Sensitized) (15 lavori pubblicati)

---

### PREMI

---

**PREMIO NASINI 2019:** In September 2019 she was awarded with the "Nasini Prize" from the Italian Chemical Society for "her relevant and original contribution in the study of complexes for application in luminescence, non linear optics and in solar cells"

---

### TEACHING ACTIVITY

---

- Lecturer of the course: CHIMICA "Modulo di Chimica Generale" (F66-4) Scienze Naturali. 2016-today
- Lecturer of the course: "Laboratorio di Chimica Generale ed Inorganica (F6X-30) 2019-today
- Lecturer of the course: "Laboratorio di Chimica" of the course "Chimica Organica e Laboratorio di Chimica" since 2021
- Lecturer of the course: "Chimica Generale e Inorganica" Modulo di Laboratorio (linea 2) (aa 2016/2017)
- Lecturer of the laboratory course of "Chemistry of Inorganic materials with lab" (aa 2016/2017)
- Exerciser for stoichiometry (Art. 45 of the new General Regulations of the University for the course of "General and Inorganic Chemistry" degree course in Agricultural Sciences and Technologies. (aa 2014/2015, 2015/2016)
- Lecturer for Chemistry in the *Summer School 2015* at Humanitas University (HUNIMED).

Supervisor of **14** thesis, co-supervisor of **44** thesis in industrial chemistry and chemistry, both three-year and master's degrees, tutor of a doctoral thesis in industrial chemistry, co-tutor of **4** doctoral theses between chemistry and industrial chemistry.

## INSTITUTIONALS ACTIVITIES

---

- Member of **Giunta** at Chemistry Department of University of Milan (since 2020).
- Member of **Collegio dei Docenti del Dottorato in Chimica Industriale** at Chemistry Department of University of Milan (since 2016)
- Member of **Collegio Didattico** Chemistry Department of University of Milan and of the Collegio Didattico di Scienze Naturali, University of Milan.
- “Consultant” of **CAMPUS MIND commission** for Area 4 – “Sintesi Organica, Metallorganica e di polimeri, Bioorganica e Chemical Biology2
- Member of **Summer School** - Progetto Lauree Scientifiche (PLS) responsible of “Inorganic-analytical module” (since 2017)
- Tutor for the first year students of Chemistry and Industrial chemistry (since 2017)
- July 2018: “**Rapporteur**” and **Member of the jury** for PhD defense ( student: Siliu Lyu) at Institutes des Sciences Moléculaires-ISM Université de Bordeaux-CNRS, Bordeaux, France.