

Gianluca Ciardelli (Ph.D.)

Full Professor of Bionanotechnology
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*Career History*

Gianluca Ciardelli has a Master Degree in Chemistry *summa cum laude*, from the University of Pisa (1994). In 1997 he received the PhD in Natural Sciences from the Swiss Federal Institute of Technology (ETH) of Zurich on synthetic degradable polyurethanes for biomedical applications.

He moved in 1997 back to Italy, where he started its activities at Tecnotessile in Prato, a private company for applied research, until June 2002. From 2002 and 2004 he was assistant professor at the University of Pisa at the Department of Chemical Engineering, Industrial Chemistry, Materials Science. In December 2004 he joined the Department of Mechanics (Bioartificial Systems Research Group coordinated by Prof. Franco Montevercchi) at the Politecnico in Turin as associated professor. He became Full Professor in 2011. He is currently managing the STReP " Photozyme Nanoparticle Applications for Water Purification, Textile Finishing, Photodynamic Biomineralization and Biomaterials Coating ", the ERA-Net "Nanostructured functional and active textiles for well-being", funded by the European Commission and is involved in several other research projects dealing with the development of biomedical polymers and microfabrication of scaffolds for tissue engineering, drug delivery for cardiovascular stents, molecular recognition. He is currently teaching Bionanotechnology, Organic Chemistry and Biochemistry, Chemico-Physical Fundamentals of Biological Systems at the Politecnico di Torino

He is the author of about 80 peer reviewed international papers, 6 book chapters and of 10 patents. The publication activity of Gianluca Ciardelli has begun in 1995, before the completion of his Ph.D studies, immediately after the release of the European Patent "Biokompatibles Blockcopolymer". The work related to his Ph.D. thesis produced 7 papers between 1995 and 1998, in peer reviewed international journals with important IF in the field of biomaterials and polymer science. In the period between 1999 and 2003, 12 papers were published in the fields of polymer science and 7 in the field of wastewater treatment.

With joining full time academic research in 2002, the publication activity increased significantly in the last 4 years with a total of 40 papers published, mainly in the field of the application of natural and synthetic materials in bio- and nanomedicine. The highest impacting journals where the papers were published are: *Biomacromolecules*, *Anal. Chim. Acta*, *Biosensors and Bioelectronics*, *Macromol. Biosci.*, *J. Membr. Sci.*, *J. Cell. Mol. Med.* In the latest part of his career, Gianluca Ciardelli authored also 3 book chapters, 2 of them published by Springer, in bionanotechnology. Collectively, according to an author search on Web of Science, 81 publications authored by Gianluca Ciardelli between 1995 and 2011 can be found. Papers were published constantly in this period with peaks of 8 papers in 2001 and 2005, 9 in 2008, 10 in 2010, and 11 in 2006. The total number of citations is 1018 (723 without self-citations), with a steadily increasing number of citations with a maximum of 165 in 2009 and 2010. The average citation per item is 12.57, the h-index is 18.

General description of research activities

The research activity as a chemist started in 1992, by working at the Swiss Federal Institute of Technology, Zurich, Switzerland. There, it was possible to clarify the biocompatibility and biodegradation pathways of newly developed multiblock copolymers (Degrapol TM). The goal was achieved through challenging synthetic strategies to obtain fluorescence labeled equivalents of the polymer itself and its building blocks, followed by the determination of the cell response to the materials using fluorescence aided investigation tools. In this period, in which the Ph.D in Natural Sciences was earned in 1997, the interest in manipulating the matter at the nanoscale aiming at realizing new products for medical use with controlled functional properties was developed. These research interests were maintained in the following five years, although as a part-time activity, that

of technologist for the textile industry being the main occupation. In this period, significant studies in the field of controlled polymer synthesis process in water, such as template polymerization, were carried out, clarifying the role of chemical interactions between the template and the growing chain. This information can open interesting way in learning the mechanisms with which Nature constructs its own materials, and therefore allowing to realize biomaterials with improved biocompatibility. From 2002 on, the activity could focus on Biomaterials and Bioengineering more deeply, becoming Tissue Engineering and Controlled Drug Delivery the main areas of interest. This aim was pursued through the realization of new biomaterials, either by blending natural and synthetic polymers or by synthesizing block copolymers, functionalized with peptide sequences, that are known to be in charge of the communication between cells and the extracellular matrix. This functionalization approach was attempted with traditional chemistry, but also with alternative strategies inspired by Nature, such as molecular imprinting, a technique to create template-shaped cavities in polymer matrices with memory of the template molecules. By joining Politecnico di Torino in 2004, the interactions with colleagues experienced in design and processing further stimulated to use the competence in the synthesis and preparation of functional biomaterials to realize improved medical devices, being peripheral nerve repair, degradable devices to assist orthopaedic and cardiac surgery the main targeted applications. In the last years main achievements were:

1. A multiblock, biodegradable, polyesterurethane with biomimetic properties through surface or bulk functionalisation. The material can be used as support for regenerative medicine or for targeted drug delivery.
2. A method to fabricate hollow degradable tubes to be used as grafts in peripheral nerve regeneration.
3. Polymeric nanospheres imprinted with a short peptide sequence representative of an accessible fragment of a protein of the extracellular matrix.

Career at Politecnico and roles in the organization

Career advancement at Politecnico (last 10 years)

Date	Grade
29/12/2004	Associate Professor

Degree

Year	Degree Type	Mark	Institution	Description
1994	Undergraduate/Master degree	110/110 cum Laude	University of Pisa, Faculty of Mathematics, Physics and Natural Sciences	Laurea (Master) Degree in Chemistry Title of the thesis: "Synthesis of fluorescent-labelled polyesters and polyurethanes and in vitro study of their biocompatibility" (Sintesi di Poliesteri e Poliuretani Fluorescenti e Studio in Vitro della loro Biocompatibilità)
1997	Ph.D.	n.a.	Swiss Federal Institute of Technology (ETH), Zurich, Switzerland	Doctorate in Natural Science (Faculty of Materials) Equivalent to the Italian Ph. D. as recognised by the Italian Minister of Research on 28th April 1998 according to D.P.R. 11th July 1980, n.382. Title of the thesis: "Synthesis of biodegradable, fluorescence-labelled polyesterurethanes and cell response to their slowest degradable constituents."

Career outside Politecnico

From	To	Career	Career description
1992	1995	Scientific enrolment	Scientific Co-worker at the Swiss Federal Institute of Technology in Zurich, Switzerland (Institute of Polymers)
1995	1997	Scientific enrolment	Ph.D student at the Swiss Federal Institute of Technology in Zurich, Switzerland
1997	2002	Professional enrolment	Part -time Technology Researcher and Head of Division at Tecnotessile s.r.l. in Prato (Italy), a private company for applied research.
1997	2002	Scientific enrolment	Consultant at the Faculty of Engineering Department of Chemical Engineering, Industrial Chemistry, Materials Science
2002	2004	Scientific enrolment	Assistant Professor University of Pisa, Faculty of Engineering Department of Chemical Engineering, Industrial Chemistry, Materials Science