

Editorial

Introduction by the guest editor

I am very grateful to the Editors of the *Journal of Peptide Science* who gave me the opportunity to edit this special issue entitled '*Peptides in Nanotechnology*'. Peptides can be considered extremely versatile tools for a wide range of applications both in materials and life science. In the last years, there has been an enormous increase of interest in peptides as templates in Nanotechnology, a science expected to revolutionise the future in many fields. The use of peptide to create novel nanoobjects and nanostructures with interesting properties is very promising. Indeed, natural or synthetic peptides are able to form supramolecular architectures and arrange in a predetermined manner. A fine control of the process of assembly is of fundamental importance to create new structures at the nanometre scale endowed with original properties.

This special issue is aimed at exploring the potential applications of peptides in Nanotechnology. It is certainly not exhaustive of all possibilities, but it hopefully comprises a series of representative topics.

The first six contributions concern the assembly and modulation of peptide nanostructures. Sandeep Verma has designed supramolecular structures with different morphologies based on antamanide tetrapeptide analogues, and analysed the aggregation pathways which might have implications in the formation of fibres. Dennis Löwik has discovered modified amphiphilic peptides able to disassemble nanofibres, with important implications in drug delivery and modulation of disorders associated with fibre formation. Vincent Rotello has developed gold nanoparticles functionalised with amino acids to create a surface able to interact with and to fold peptides into helical structures, to eventually modulate peptide architectures. Gregg Dieckmann has designed amphipathic peptide surfactants to disperse carbon nanotubes. This approach is one of the most effective for isolating single nanotubes and for overcoming the problem of carbon nanotube aggregation. Xiaojun Zhao has studied the self-assembly properties and the fibre formation behaviour of the natural RADA 16-I peptide, which has important repercussions in cell growth, homeostasis and tissue repair. Ernest Giralt reviewed the role and the function of peptides in nanotechnologies related to brain diseases.

In the following four articles, peptides have been used for catalysis and surface modifications. Paolo

Scrimin contributed with a comprehensive review on the development of multivalent nanosystems based on synthetic peptides for cooperative catalysis. The groups of Shunsaku Kimura and Mariano Venanzi have independently developed self-assembled and conformationally constrained peptides on gold surfaces to study the long range electron transfer mechanisms and to elucidate the efficiency of photoinduced electron transfer, towards the generation of highly stable and sensitive interdigitated microelectrodes. Hiroshi Matsui has created antibody functionalised nanotubes using the recognition of the complementary antigens patterned on gold substrates by nanolithography. This approach allows generating perpendicular crossbar geometry for logical operation as an alternative to semi-conducting nanowires.

Two contributions describe the generation of peptide nanotubes for different purposes. Carl Henrik Görbitz has developed hydrophilic dipeptide nanochannels filled with water, while Ehud Gazit has proposed the use of self-assembled dipeptides as an 'ink', eventually patterned on a surface using an inkjet printer.

Finally, the last two articles illustrate the cyclic peptide-based templates. Pascal Dumy has provided a state-of-the-art on the development of cyclopeptide scaffolds as new architectures to assemble different types of biopolymers with therapeutic properties for biomedical applications. Jaun Granja has designed cyclic peptides containing alternate α - and γ -amino acids, which form nanotube molecular caps preventing the formation of extensive β -sheet like H-bonding network.

In conclusion, I hope that this special issue reflects the recent advances in the use of natural and synthetic peptides for nanotechnological applications. The results described in the different articles will certainly stimulate further studies bringing together researchers with different expertise coming from different disciplines including chemistry, physics, biology, medicine and engineering.

I would like to also thank all authors for their interesting contributions and their efficient and timely exchanges.

Alberto Bianco
Guest Editor