

PepMat 2016: the second conference on peptide-based materials for biomedicine and nanotechnology

During the last quarter century, research into peptide-based materials has established itself as an interdisciplinary, independent, and very active branch of science, embracing many areas of physics, chemistry, biology, and computer science. More recently, the development of complex multimolecular structures, usually at the nanometer length scale, from naturally occurring biological compounds has aroused a great deal of interest, giving place to a new research discipline called 'nanobiology'. Peptide-based materials have occupied a leading position in this new field. However, often, specific applications drive research. They present new problems and necessitate convergence with other fields. Controlled manipulation of peptide nanostructure and microstructures and their mechanisms provides an exceptionally challenging scientific goal. Within this context, the algorithms, tools, concepts, and methods developed in Materials Science appear to have a tremendous potential in the utilization of peptides as a unique class of materials, which alone or combined with more traditional materials (e.g. polymers and inorganic particles) offer inspiration in the development of ambitious applications, especially in the biomedical and nanotechnology field.

Prof. Mariano Venanzi (Università di Roma Tor Vergata), who early realized potential of combining peptide research, nanobiology, and materials science, was the main organizer of the symposium 'Peptide-based Materials: From Nanostructures to Applications', which was celebrated as part of the Spring Meeting of the European Materials Research Society in 2010 (Strasbourg). After that successful symposium, Prof. Venanzi accompanied by Prof. Giancarlo Morelli (University of Naples Federico II) chaired PepMat 2013, the First International Conference on Peptide Materials for Biomedicine and Nanotechnology, in Sorrento (October, 2013). The Second Conference (PepMat 2016), which was held in the center of Barcelona in March 2016, represented a unique opportunity to consolidate the exchange of knowledge, experience, and innovative ideas in this growing field. Undoubtedly, the second edition of PepMat allowed crystallizing many collaborations and new projects among leading researchers in the field, while serving as a meeting point for researchers collaborating frequently. Besides, it was an opportunity for the younger and less experienced researchers to exchange views with experts.

A total of 9 plenary lectures (45 min) and 19 lectures (30 min) and a lively poster session with 29 contributions provided an attractive 2.5-day program for scientists from more than 35 institutions and 15 countries. The scientific content of the plenary lectures, lectures and poster presentations reflected the state of the art in established and emerging aspects of the topic of the conference.

The present issue of the Journal of Peptide Science, which collects three reviews and ten full articles, offers exciting examples of the field, highlighting that peptide-based materials are compatible

with the use of a wide range of techniques but demands the convergence of disciplines.

Hamley and coworkers reviewed the properties and activities of lipopeptides and peptide hormones, relating their uses as therapeutic drugs with the influence of the self-assembly on bioactivity. In their review, Rosenman and coworkers propose a novel field of bio-nano-photonics based on a new concept of optical waveguiding in synthetic elongated peptide nanostructures composed of ordered peptide dipole biomolecules. Venanzi and coworkers analyze the role of the conformationally constrained α -aminoisobutyric acid residue in the aggregation and self-assembly of oligopeptides, paying special attention to the recent work of the group in the field.

After the reviews, the issue contains ten full articles. Reches and her colleagues show that the covalent inhibition of HIV-1 integrase by a lens epithelium derived growth factor-p75 peptide is governed by the spontaneous formation of fibrils, which are in equilibrium with the active monomeric form. The implications of the use of fibrils as storage vehicles of peptide monomers for inhibiting other disease-related proteins are also discussed. Diaferia *et al.* study the assembling properties and magnetic resonance relaxation behavior of telechelic polyethylene glycol-polymers end-capped by diphenylalanine motives and containing a chelating agent complexed to Gd(III) ion, bound on a lysine side chain at the center of the peptide moiety. The work of MacCloskey *et al.* focuses for the first time on the ability of an ultrashort Fmoc-peptide gelator to eradicate established bacterial biofilms implicated in a variety of medical devices infections. Lutz *et al.* employ interface specific vibrational spectroscopy and coarse-grained molecular simulations to illustrate that peptide-driven biosilification is greatly affected by N-terminal peptide modifications. Markey *et al.* investigate *in vitro* the inflammatory potential of a β -sheet forming peptide hydrogel by encapsulating murine monocytes within it and using the production of cytokines as makers of inflammatory response. Mazzier *et al.* report on the light-induced topochemical polymerization of a symmetrical dipeptide-based diacetylene system, which self-assembles into compact fiber networks with ordered diacetylene moieties. The article of Puiggali-Jou concerns the detection of biomolecular recognition events between peptide-functionalized microcantilever arrays and fibrin, fibrinogen, or bovine serum albumin by means of nanomechanical sensing. Selmin *et al.* characterize a new hybrid material composed of poly (lactide-co-glycolide) functionalized with a 6-mer penetrating peptide consisting of alternating arginine and unnatural cyclohexylalanine residues that is proposed as a potential mitochondria-targeting cell permeable vector. Triguero *et al.* apply first principle calculations to examine the conformational preferences of the recently engineered Arg-GIE-Asp sequence (GIE is an amino

acid bearing a 3,4-ethylenedioxythiophene ring as side group) that was recently used as adhesive biointerface. Yamazaki *et al.* show the preparation of nanocarriers carrying Lewis y, a specific tumor-associated carbohydrate antigen of a well-defined carbohydrate, on the surface, and analyze its antigenicity as function of the surface density and nanocarrier morphology.

We expect many more exciting advances to develop over the coming 2 years making the next PepMat meeting, planned for 2018 in the UK, a much anticipated event.

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