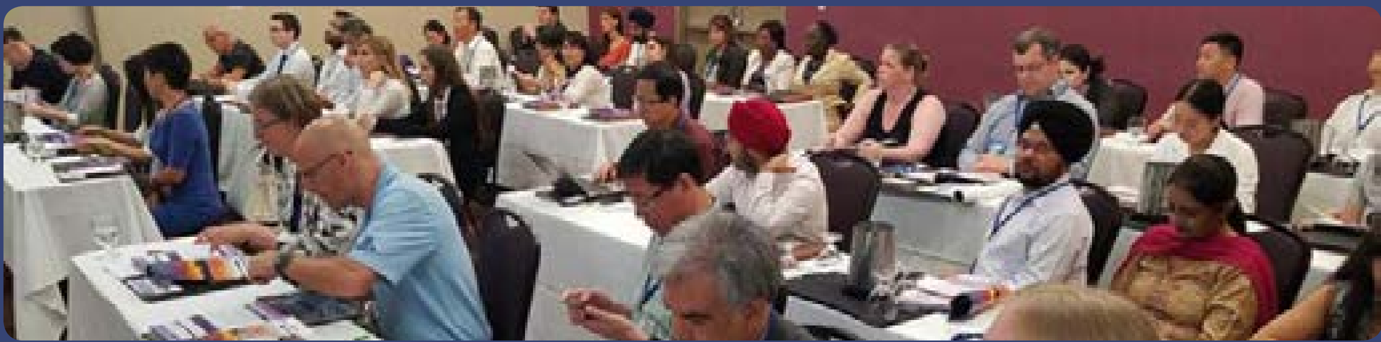

11th International Conference on

ADVANCED MATERIALS & PROCESSING

September 07-08, 2017 | Edinburgh, Scotland

Keynote Forum

Day 1

Haruo Sugi, Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-004

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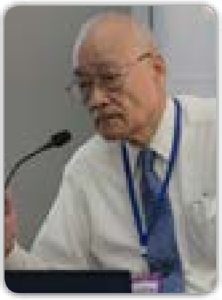

Haruo Sugi

Teikyo University Medical School, Japan

Direct recording of myosin head power and recovery strokes in hydrated myosin filaments provides evidence against the swinging lever arm mechanism in muscle contraction

Muscle contraction results from relative sliding between actin and myosin filaments, which in turn is caused by cyclic attachment and detachment between myosin head extending from myosin filaments and active sites on actin filaments. A myosin head consists of catalytic (CAD), converter (COD), and lever arm (LD) domains, and connected to myosin filament backbone via subfragment-2. Based on crystallographic and electron microscopic studies on static structures of myosin heads and acto-myosin complex, it has been proposed that myosin head exerts power stroke by active rotation of CAD around CD, coupled with ATP hydrolysis. This mechanism is called "swinging lever arm mechanism", and now appears in every textbook as a dogma explaining molecular mechanism of muscle contraction. Using the gas environmental chamber, in which hydrated biomolecules can keep their function in the electron microscope, we succeeded in recording ATP-induced power and recovery strokes of myosin heads, which are position-marked with two different antibodies, attaching to junctional peptide between 50k and 20k segments of myosin heavy chain in CAD(antibody 1), and to reactive lysine residue in COD (antibody 2), respectively. Although antibody 1 covers two main myosin-binding sites on actin to inhibit formation of actin-myosin linkages, it has no effect on both Ca^{2+}-activated muscle fiber contraction and in vitro actin-myosin sliding. On the other hand, antibody 2 shows no effect on muscle fiber contraction, but completely inhibits in vitro actin-myosin sliding. These findings, together with our success in recording power stroke of myosin heads position-marled with antibodies 1 and 2, constitute evidence against the dogma (or textbook view) that (1) during muscle contraction, myosin heads do not pass through rigor configuration, and (2) muscle contraction does not results from active rotation of CAD around COD.

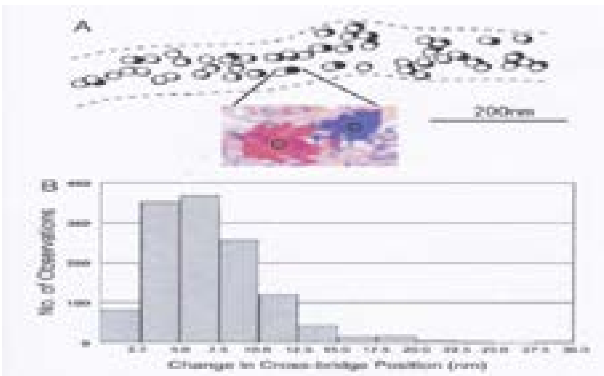

Figure 1: *ATP-induced myosin head recovery stroke in the absence of actin filament. Open and filled circles (diameter, 20nm) show the position of gold particles, attached to myosin heads with antibody 1) before and after ATP application, respectively. (Inset) Enlarged view showing the position of gold particle before (red) and after (blue) ATP application. (B) Histogram showing amplitude distribution of ATP-induced myosin head recovery stroke.*

Biography

Haruo Sugi graduated from postgraduate School in the University of Tokyo, Japan, with a PhD degree in 1962, and was appointed instructor in the Department of Physiology in the University of Tokyo. From 1965 to 1967, he worked at Columbia University as a research associate, and at the National Institutes of Health as a visiting scientist. He was a professor and Chairman in the Department of Physiology, Teikyo University Medical School, Japan, from 1973 to 2004, when he became an emeritus professor. Sugi was also chairman of the muscle committion in the International Union of Physiological Sciences (IUPS) from 1998 to 2008.

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Leszek A Dobrzanski, Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-004

11th International Conference on

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Leszek A Dobrzanski

World Academy of Materials and Manufacturing Engineering, WAMME, Poland

The skeleton microporous materials with coatings inside the pores for medical and dental applications

A significant and costly problem of the modern medicine is the necessity to replace or supplement organs or tissues to prevent the biological and social degradation of patients and to restore their living functions, resulting from a growing number of cases of organ or tissue loss or damage in the human population due to post-injury or post- resection losses as well as those originating from the operative treatment of cancerous tumours or inflammation processes and as a result of the work, traffic and sports accidents. The own works covered by this article form part of completely original and pioneer research over the development of original author's concepts concerning the development of original hybrid clinical prosthetics and implantation techniques in the area of medicine and regenerative dentistry and tissue engineering methods allowing for the natural growth of living tissues into microporous parts of implanted medical devices. An engineering manifestation of such concepts is the creation of a new generation of original hybrid microporous high-strength engineering materials ensuring the development of original hybrid constructions of a new generation of personalised implant-scaffolds and tissue scaffolds. The most important is to develop an original hybrid technology of fabrication of a new generation of custom implant- scaffolds and tissue scaffolds using skeleton titanium or Ti_6AlV_4 alloy microporous materials manufactured by Selective Laser Sintering. They exhibit porosity and the related mechanical properties dependent on the manufacturing conditions, including mainly laser power, laser beam diameter and distance between laser beams and distance between laser remelting paths. In order to ensure conditions for the nesting and proliferation of living tissues in the micropores of the created porous microskeletons, tests were performed of the deposition of the internal surface of micropores with TiO_2 and Al_2O_3 layers by ALD technology supporting the growth of living tissues in a microporous bonding zone with scaffolds or implant-scaffolds created from engineering materials.

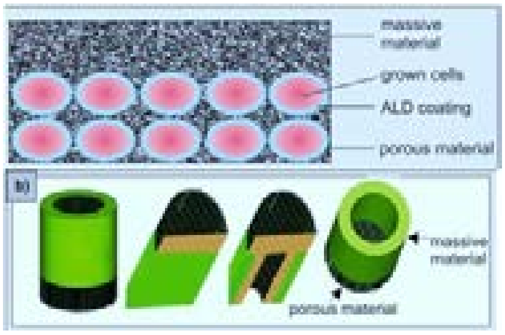

Figure 1: *The rigid biological-engineering material which may represent a microporous part of original implant-scaffolds with a microporous skeleton and deposited coatings by the atomic layer deposition method inside the pores supporting the growth and proliferation of living cells.*

Biography

Prof. Leszek Adam Dobrzanski is a Full Professor of Materials Engineering, Manufacturing Engineering , Nanotechnology, Medical and Dental Engineering in the Silesian University of Technology in Gliwice, Poland and a Supervisory Board Chairman, Project Manager and Principal Investigator in the Medical and Dental Engineering Centre for Research, Design and Production ASKLEPIOS Ltd in Gliwice, Poland. He is a Doctor Honoris Causa of the Universities in Bulgaria, Hungary and Ukraine. He is a Fellow of the Materials Science Committee of the Polish Academy of Sciences PAS and the President of the Metallic Materials Section of this Committee. He is a Vice President and a Fellow of the Academy of Engineers in Poland. He is a foreign Fellow of the Ukrainian Academy of Engineering Sciences and the Slovak Academy of Engineering Sciences. He is the President of the World Academy of Materials and Manufacturing Engineering, and a President of the International Association of Computational Materials Science and Surface Engineering. He is the Editor-in-Chief of the Journal of Achievements in Materials and Manufacturing Engineering, Archives of Materials Science and Engineering and Open Access Library.

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Alla Zak, Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-004

Alla Zak
Holon Institute of Technology, Israel

Single wall and multiwall WS_2 nanotubes synthesis and characterization - The update

The discovery of inorganic nanotubes (INT) of layered transition metal dichalcogenides (MoS_2 and WS_2) more than two decades ago opened the new research field in a solid state chemistry and in nanomaterials science. However, wide investigation of their properties and applications require the preparation of pure phase powders and in significant amounts. Careful study of the growth mechanism of WS_2 multiwall nanotubes (MWINT) resulted in pure phase INTs production and suggested their simple scaling up. The obtained nanotubes are of 30–170 nm in diameter and 5-25 micron in length, of perfect crystallinity and needle-like morphology. In addition, we have demonstrated that single- to triple-wall WS_2 nanotubes (SWINT), of 3-7 nm in diameter and 20-200 nm in length, can be produced by high-power plasma irradiation of big multiwall WS_2 nanotubes. Being of single or few-layers wall width these nanotubes promise to be of unusual electro-optical characteristics, which are under study nowadays. Very similar in their properties, the MoS_2 and WS_2 compounds demonstrate significantly different behavior during their synthesis from corresponding oxides through gas-phase high temperature reaction. Instability of precursor MoOx against reduction in high temperature processes makes INT-MoS_2 production very challenging and become an obstacle in the way of their reproducible preparation during these years. Finally, we can report on the reproducible, catalyst free and aspect ratio controlled synthesis of MoS_2 inorganic nanotubes (INT) from molybdenum oxide. The obtained nanotubes are of 10-20nm, 40-80 nm or 100-300 nm in diameter, and lengths - up to tens of microns, depends on reaction parameters. INT of MoS_2 are both 40% lighter and 40% stronger compared to the analogous WS_2 nanoparticles and hence more beneficial for tribological and composite applications. Being semiconductors, both MoS_2 and WS_2 nanotubes are good candidates forphotovoltaics and optoelectronics.

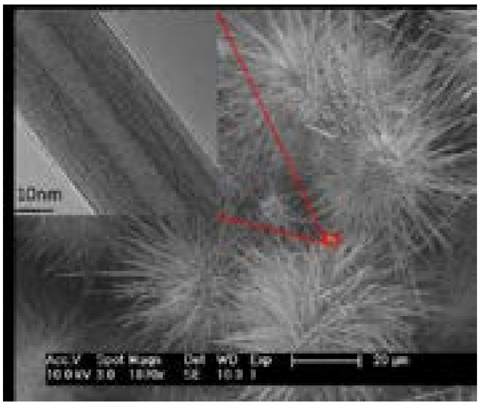

Figure: *SEM micrograph of INT-WS2, insert – TEM image.*

Biography

Dr. Alla Zak is a Head of the Laboratory for Synthesis and Investigation of Nanomaterials and Senior Lecturer in the Faculty of Science in the HIT-Holon Institute of Technology, Israel. She is also a Scientific Adviser in the Department of Materials and Interfaces in Weizmann Institute of Science (WIS), Israel. She has made a major contribution to the study of the growth mechanism and scaling-up of the fullerene-like (IF) nanoparticles of WS_2 and the inorganic nanotubes (INT) of WS_2 and MoS_2. The IF-WS_2 nanoparticles are now fully commercialized as superior solid lubricants. Furthermore, she was among the early researchers to show the importance of the WS_2 nanoparticles and nanotubes as reinforcing elements in polymer nanocomposites.

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September 07-08, 2017 | Edinburgh, Scotland

Keynote Forum

Day 2

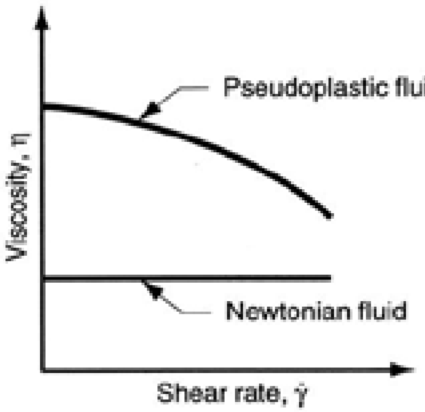
Mosongo Moukwa, Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-004

Mosongo Moukwa

Spartech LLC (formerly PolyOne DSS), USA

Influence of non-Newtonian behavior of polymers on their processing characteristics

During the manufacture of polymeric (or plastic) materials, polymers are subjected to flow. The way these liquids react is determined by the shapes, or configurations that the molecules adopt. Polymer molecules behave like springs, and become stretched by the flow, giving rise to the strongly elastic behavior of polymeric fluids. The study of the dynamics of polymer molecules is very important for the understanding of flow of polymeric fluids. The unique properties of polymers are often not apparent until they are encountered by chemical engineers on the job. The unique qualities of polymers most evident in their processing, the fabrication of bulk polymer (resin) into a finished article, which typically requires an entirely different equipment than that required to process conventional liquids. What makes polymeric materials interesting in this context is the fact that their time constants for flow are of the same order of magnitude as their processing times for extrusion, injection molding and blow molding. In very short processing times, the polymer may behave as a solid, while in long processing times the material may behave as a fluid. This dual nature (fluid-solid) is referred to as viscoelastic behavior. Elastic stresses in polymeric and other complex fluids can give rise to strange flow behavior not seen in Newtonian fluids. This can for example, produce undesirable instabilities in industrial processes. Interfacial instability in co-extrusion leads to defects consisting of highly irregular or sometimes regular waviness which appears in coextruded structures at the polymer/polymer interface. The effect is to significantly reduce the optical quality of coextruded film. It is an internal defect, which distinguishes it from sharkskin, which is a surface defect. In this presentation we will discuss how the non-Newtonian behavior affects processing of polymers, using examples.



Biography

Mosongo Moukwa is a senior level management professional and entrepreneur recognized for his achievements to helping companies improve their profitability by commercializing new technologies and developing new markets. His was Vice President of Global Technology at Johnson Polymer, WI, now part of BASF, Vice President of Global Technology at Reichhold, NC, and Vice President of Technology at Asian Paints, India. He is now Director of Technology at PolyOne Designed Structures and Solution LLC, based in Saint Louis, MO. He holds a PhD from the Universite de Sherbrooke, Quebec, Canada and was a NSERC postdoctoral fellow at Northwestern University, IL.

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Denis Spitzer, Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-004

Denis Spitzer

NS3E Laboratory, France

Continuous nanocrystallizing of medicaments by spray flash evaporation

The NS3E laboratory conceived the Spray Flash Evaporation (SFE) for nanocrystallizing medicaments nanoparticles in an industrial scale. The process was several times patented. The medicament to be nanocrystallized is first dissolved in a low boiling solvent. The solution is kept in a pressurized tank separated from a vacuum chamber by a heated hollow cone nozzle used to spray the liquid. The fast evaporation of the solvent is induced by the combination of the abrupt pressure drop and the high energy stored in the overheated solvent prior to nebulisation. The flash evaporation leads to nanoparticles with narrow size distribution. The nanoparticles may be composed of single compounds, mixtures of several substances or cocrystals. In the domain of medicaments, cocrystals are of high importance as they enhance bioavailabiliy and up-take by the human body of Active Pharmaceutical Ingredients (API). Up to now, most used techniques are of batch nature and are not able to give access in big amounts to nanosized crystals or cocrystals of therapeutic interest. The SFE permits the continuous manufacturing of nano-sized cocrystals, in large amounts with a kinetic complying with the pharmaceutical industry's requirements. The efficiency of SFE is shown by the manufacturing of pure nanomedicaments but also of nano-cocrystals such as Resveratrol/4-Amino Benzamid (1/1), Caffeine/Oxalic acid (2/1) and Caffeine/Glutaric acid (1/1), with a mean particle size of between 30 and 100 nm. After showing the possibility to continuously nanocrystallize medicaments, the presentation will focus on different main challenges to further enhance the production capacity and also to understand the mechanism of SFE. Among different techniques and metrologies used or specially developed such as Phase Doppler Interferometry and AFM-TERS spectroscopies (Figure), the presentation will also focus on different crystallization configurations and scale-ups used.

Biography

Dr. Habil. Denis SPITZER received his PHD in physical chemistry in 1993 at the University Louis Pasteur of Strasbourg. He is the founding and current Director of the NS3E Research Laboratory UMR 3208 ISL/CNRS/UNISTRA. He conducts research in continuous nanoscristallization processes of organic nanomaterials such as model medicaments and energetic materials. He is the inventor of the SFE process. He is the author of more than 150 publications and scientific reports. He received in 2013 the award of strategic thinking given by the French Homeland Minister, and more recently, in 2015, the « Grand Prix Lazare Carnot » award of the French Academy of Science, for dual use research.

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Notes:

Jeong-Woo Choi, Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-004

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Jeong-Woo Choi

Sogang University, Korea

Hybrid biomaterials for nanobioelectronic device: toward biocomputing system

Hybrid biomaterial for nanobioelecronic devices have emerged as a breakthrough with huge potentiality to generate new concepts and technologies for the development of new age electronic devices. The main concept of bioelectronics was generated from the fact that biomaterial, especially metalloproteins, can be used as a functional unit in an electronic device. Major challenges in bioelectronic field include the miniaturization, and the demonstration of various functions implemented in biomaterial to alter silicon-based electronic devices. It has been difficult to demonstrate a single molecular-based computing device in current computing system, since such silicon-based system requires complex functionality to be developed at the single molecular level. In this point of view, metalloprotein-based conceptual biomemory device was developed which demonstrateed memory characteristics including 'read', 'write' and 'erase' function. Further, multi-bit memory function and nanoscale memory function are also demonstrated. Afterwards new hybrid material including metalloprotein/DNA/nanoparticle has been developed to construct bioprocessing device to achieve various functions at the single molecular level. A metalloprotein that exhibits redox property is used as a biomemory signal source, and various nanoparticles with complementary DNA and metal ions are used as input signals to acquire processed output signals. Various functions including 'information reinforcement', 'information regulation' and 'information amplification' are accomplished in this device due to various input signals. The proposed hybrid material-based bioprocessing device by the integration with neural cell should be a new type of platform for development of biomolecular-based biocomputing system.

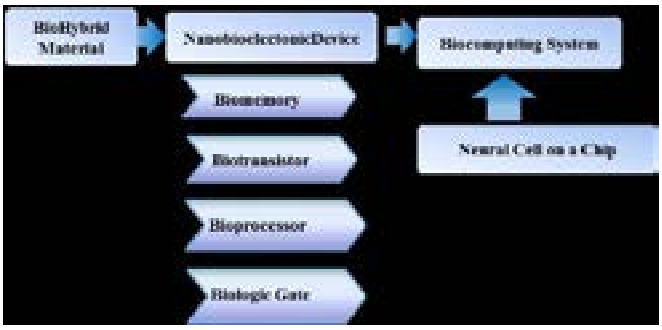

Figure1: *Hybrid biomaterial based nano-bioelectronic device toward Biocomputing system*

Biography

Jeong-Woo Choi received his Ph. D. in 1990 at Rutgers University, USA and D.Eng. at Tokyo Institute of Technology, Japan in 2003. He worked at IBM Almaden Research Center and Mitsubishi Electronics Advanced Technology R&D Center as a visiting researcher in 1993 and 1996, respectively. He has been a professor of Department of Chemical & Biomolecular Engineering, Sogang University, South Korea, for over 25 years. He is a leading researcher in the field of nanobiomaterials and nanobioelectronics. He has published over 370 peer-reviewed papers in Science, Adv. Mater., ACS Nano, Angewandte Chemie, Adv. Funct. Mater., and etc..

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Notes:

Francisco Javier Pérez, Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-004

Francisco Javier Pérez

Universidad Complutense de Madrid, Spain

Molten salts & molten salts technology: Past, present and future in materials and processing technology

In the past molten salts where associated to the high temperature corrosion processes that appeared in the combustion of fossil fuels or that appears in gas turbines. From years ago renewal energies appears in the molten salts scenario, for example with the development of biomass and waste incineration plants, where the production of energy where associate also with the undesirable molten salts that corrodes the plant and decreasing at the same time their lifetime. On the other hand, it appears technologies, that far away that dealing with undesirable salts, they want to use the properties of molten salt systems to use them in the power plants: this is the case of molten carbonate fuel cells and solar power concentration plants (CSP), as thermal storage fluid. The possibility to increase their efficiency and to be more competitive energy resources, in comparison with fossil and nuclear, deals with molten salt technology, and new molten salts mixtures development. A review of the corrosion mechanisms of those above different applications will be done, with the possibilities in the use of coatings for corrosion protection and the possibility to use their capabilities to monitor the corrosion "in situ" for the electrochemical corrosion mechanism associated with this corrosion phenomena. According to this a new hot corrosion mechanism under dynamic conditions will be establish for the operating conditions in CSP plants, The future roadmap for those molten salts technology processes and materials design associated with will be described in order to establish their potential capabilities.

Biography

Dr. Francisco Javier Pérez, is a Director of Material science and metallurgy Engineering at Universidad Complutense de Madrid, Spain. His international experience includes various programs, contributions and participation in different countries for diverse fields of study. His research interests as a Scientist reflect in his wide range of publications in various national and international journals.

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Nekane Guarrotxena, Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-004

Nekane Guarrotxena

Spanish National Research Council (CSIC), Spain

SERS tag-therapeutic drug delivery, multimodal imaging, multiplexed sensing and diagnosis metal-nanosystems

The high demand of multifunctional tools for effective labeling, imaging, sensing leading to both diagnostics and therapies, in nanomedicine, could be addressed by using multifunctional nanomaterials. Noble metal nanoparticles (NPs) are especially useful in this context. They exhibit optical excitations known as surface plasmons, extremely dependent on the NPs-morphology, -assembly, and medium which establish the basis for the molecular recognition, imaging and sensing sensitivity. On the other hand, these surface plasmons also induce large electromagnetic field enhancements, greatly useful in Surface-enhanced Raman spectroscopy (SERS) technique. In fact, the exceptionally strong field enhancement at the interstitial sites between coupled metal NPs, allows detection at the single molecule level; and due to the fingerprint capabilities of SERS, also with high selectivity. Moreover, the relevant implementation of SERS tags design has opened new pathways and strategies for the SERS application in the clinical and medical field. The plasmon resonance can either radiate light, which is a useful applicability-process in optical and imaging fields, or be rapidly converted to heat with potential application in therapy and drug loading field. In this contribution, I will present our own and up-to-date literature results regarding the promising use of noble metal nanoparticles (NPs) for biomedical applications. In particular, I will describe NPs synthesis, assembly and conjugation with biological and biocompatible ligands, plasmon-based labeling and imaging, sensing, diagnostic and therapy.

Biography

Dr. Nekane Guarrotxena earned her PhD in chemistry from the University of Complutense, Madrid-Spain in 1994. She held post-doctoral research positions at the Ecole Nationale Superieure d´Arts et Metiers, Paris-France (1994-1995) and the University of Science II, Montpellier-France (1995-1997). She was the Vice-Director of the Institute of Polymer Science and Technology (ICTP)-CSIC (2001-2005). From 2008-2011, she was visiting professor in the Department of Chemistry, Biochemistry and Materials at University of California, Santa Barbara-USA and the CaSTL at University of California, Irvine-USA. She is currently Research Scientist at the Institute of Polymers Science and Technology, CSIC-Spain. She has been involved for several years on the dissemination of Science and Technology of Polymers-plastics (where she served as a member of Scientific Committee of Escuela de Plasticos y Caucho and FOCITEC or Association for the Promotion of Science and Technology). She is Editorial Board member of some materials science and chemistry journals and Organizing Committee member of several scientific and technological events. She also serves as Externalexpertise Consultant on I+D+I Management and Policy for National and International Agencies. Her studies have been published in more than 60 peer-reviewed publications, 4 books (also co-editor) and 22 book chapters. Her research interest focuses on the synthesis and assembly of hybrid nanomaterials, nanoplasmonics, and their uses in nanobiotechnology applications (bioimaging, drug delivery, therapy and biosensing).

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