Editorial

Structured Nanomaterials - Synthesis, Characterization and Biomedical Application

Nowadays, a promising transfer from chemistry to molecular nanotechnology can be accomplished by designing supramolecular systems, based on different chemical species, in well tailored ways for solving specific purposes.

During the past decade, several methods have been performed on the synthesis of nano-structured materials, such as: wet chemical route (including colloidal methods, sol-gel methods), vapor phase transport with a vapor–liquid–solid (VLS) growth mechanism, chemical vapor deposition, nano-particle assisted deposition (NPAD), layer-by-layer self-assembly (LbL) method (slow but attractive because of its inherent simplicity) and techniques of immobilization (i.e. Langmuir–Blodgett and dropcasting) facing a weak interaction between the sensitive element and the support, improved by using of Matrix Assisted Pulsed Laser Evaporation (MAPLE) method.

Novel intelligent nanostructured materials (molecular films, membranes and supramolecular arrays) can exhibit a wide diversity of optoelectronic and chemical properties, such as: photophysical, photochemical, electrochemical, second and third order polarizabilities, piezoelectricity, conductivity, ferroelectricity, ferromagnetism, molecular recognition, thermoresponsive with high contrast ratios between transparent and opaque states, catalytic and electrocatalytic activity.

Because of their amazing properties, structured nanomaterials can be employed in manufacturing of electronic devices and various technological applications. These systems are often highly porous being used for development of molecularly-based sieves or shape-selective solid catalysts. Successful applications of the supramolecular species as chemo-responsive materials have also been examined for developing a large variety of chemical- and bio-sensors.

The present issue is dealing with state of the art methods in chemistry and biomedical applications, which are in great connection with the obtaining of advanced structured nanomaterials, providing interesting photophysical, photochemical and biological properties with a wide range of applications starting from biomedical enantioanalysis to antibacterial and fungistatic activities and going to the field of the directional cell growth and photosensing in photodynamic therapy. Another goal of this volume is an approach to new methods for evaluation of advanced photosensitivity or morphological analysis of some pharmaceutical substances or inorganic-organic hybrid nanomaterials.

In this respect, the study leaded by Gavriliu *et al*. discusses a new method of TiO_2Np doping with silver nanoparticles (Ag^0Np) in order to extend the antibacterial characteristics of this material. A mechanism of Ag^+ ions reduction reaction to Ag^0Np is also proposed. The biological tests have shown high antibacterial and fungistatic activities.

In the research paper by Ciobanu *et al*., a new type of gel for skin diseases treatments, which consists of AgNPs synthesized in a bio-polyurethane matrix, is presented. Bio-polyurethane gel has also bio-mimicking structure consisting of Arg-Gly-Asp (RGD) tripeptidic sequences signal and helps the cell growth and proliferation, which are bonded on the macromolecular chain. The new product had both an antimicrobial and a visible regenerative action upon skin and hair follicles.

The unique photochromic characteristic of the azobenzenic materials, which permits to generate nano-structured surface with potential application in biology, especially in the field of the directional cell growth, are the main concern of the paper by Hurduc *et al*. The behavior study and the correlations with the surface properties modification, using the contact angle method, is presented. As an additional investigation method, molecular modeling studies were performed in order to evaluate the dipole-moment values of the azobenzenic groups and the conformational changes of the chains, induced by the *trans-cis* isomerization process.

The perspectives for application of the new hybrid materials as photosensitizers for photodynamic therapy, based on the fact that an immobilized porphyrin dye exhibits intensive absorption of light in the red-near IR region and that red light has better penetration through biological tissues are the subject of Fagadar-Cosma *et al*. paper. In order to obtain transparent colored gels different approaches of sol-gel method are discussed. The synthesized nanomaterials display spherical and highly monodispersed particles of ultralow size, controlled shape, and high porosity, and are extremely stable.

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The review by van Staden *et al*. is an overview regarding the importance of biomedical enantioanalysis for rapid diagnosis. Enantiomers of the same chiral (bio)marker were found to be responsible for different diseases. Enantioselective, potentiometric membrane electrodes were proposed for the enantioanalysis of (bio)markers. Different types of maltodextrins were used for the design of these electrodes. The response characteristics as well as their selectivity and enantioselectivity made possible the reliable diagnosis. The advantage of using such electrodes in biomedical enantioanalysis is their high reliability, fast response and the low cost of the analysis.

Taking into account the advanced photosensitivity of some pharmaceutical substances, Szabadai and co-workers have developed a model study, performed in the concrete case of retinol acetate (vitamin A), a compound with well-known photosensitivity, by using a photochemical reactor of original conception. In the case of vitamin A, a single dominant photochemical process seems to take place, as suggested by HPLC, UV-spectroscopy and chemometric processing of spectrophotometric data. The employed processing technique is suitable even in the case when the spectroscopic behavior of the reaction product is unknown.

I express my deepest appreciation to all the researchers for their extremely valuable contributions.

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