PLENARY LECTURES

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OUR APPROACHES TO NANOTECHNOLOGY FOR TECHNIQUES, HOUSEHOLD, HEALTHCARE, SAFETY AND DEFENCE

The lecture is focused on new applications of nanostructures (e.g. polyaniline nanofibrils and nanotubes) in photonics, sensing and biosensing, including single cell interactions and encapsulation of living cells, nanoneural networks, but also polymer SRS LED and lasers electrically powered. These are very promising area.

The main topics include: biosensors and nanobiodetectors for fast detection of biologically active molecules and living cells, including bacteria; nanochemosensors for detecting chemicals, including aromatic nitro-compounds (a model for TNT) and a new smoke detector; nanoparticles (Au, Ag, Fe_3O_4, polyaniline) for a various applications in microbiology and medicine; nanotubes, micro- and nanofibrils (of carbon, polyaniline and other polymers) for nanobiodetectors and other biomedical applications; polyaniline micro- and nanonetworks and layers for nanosensors and 3D scaffolds used in cell cultures and biotechnology; surface micro- and nanomodifications of glass, Au, Ag and stainless Steel.

Conducting polymers and polymer nanostructures are particularly interesting, because of their unique physicochemical properties and applications in sensors, photonics (e.g. first polymer SRS LED [1]), molecular electronics and nanoelectronics (e.g. nano neural networks as future post-silicon logic systems).

During last few years different type of nanobiodetectors have been designed and tested in our laboratory - all based on non-specific interaction of living cells with conductive polymer nanofibrils [2-4]. These are fast and sensitive devices, useful for important biomedical applications [5].

Now, we are interested in compact, microfluidic detection units, which are designed to be used in construction of automatic analytical systems (NCBR project in progress).

References:

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[3] Langer K., Barczynski, P., Baksalary, K., Filipiak, M., Golczak, S., Langer, J. J., A fast and sensitive continuous flow nanobiodetector based on polyaniline nanofibrils. Microchimica Acta 159 (2007), 201-206.

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functionalized materials, material chemistry

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CHEMISTRY FOR NANOTECHNOLOGY

In recent years, there has been redefined chemist working processing order during the synthesis of new chemical compounds. The new philosophy proceedings chemists answer to the question: what physical and chemical properties are to have a new chemical compound, and what should be structured, and then answer the question: how do you get it and you need to define the budget this task. By conventional chemical synthesis obtain the compounds, which is then used to create new functional materials having the properties of scheduled.

The presentation of the applicability of molecular receptors in the preparation of new functional materials promotes the new approach to the work of chemists. The basic research in which we define the properties of individual molecules and molecular receptors can be the beginning of the application of these compounds in the material chemistry. Additionally it can lead to the synthesis of the new materials with the specific properties or the selective construction of the measuring nanosystems.

The process from the molecules to modern material chemistry is limited only by the imagination of chemists. This process demands for new organic materials in the nanotechnology and the new generation of the selective measurement nanosystems.

The getting knowledge of the methods of chemical compounds synthesis on the planned construction site, both in terms of arrangement of atoms and functional groups, as well as spatial structure, allowed to obtain a number of new molecular receptor systems that are capable to creating host-guest complexes. The paper will present the way of the proceedings from molecular receptor to new nanomaterial, so in other words from individual molecules to the new material with specific and previously planned properties.

References:

[1] G. Schroeder, Molecular receptors. From receptor molecules to functional materials, Wiadomości Chemiczne, 2011, 65, 1021-1054.
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EUROPEAN ROADMAP FOR NANOTECHNOLOGY 2020. NANOTECHNOLOGY: DIRECTIONS FOR ECONOMICAL AND FOR SOCIETAL NEEDS IN 2025

After 20 years growth wild nanoscience and nanotechnology research and development there is a need for reflection and to develop a targeted vision for the future economic success and society welfare. This lecture will provide some guidelines for the whole nanotechnology domain:

- Need for European Centres/networks of excellency: nanosynthesis, characterisation, properties, modelling....Needs for new structured European organisation schemes!

- Forerunner's position of nano-electronics in Europe: "Centre of Excellency"
- Stimulus for nanotechnology in medicine e.a. nanoCancer treatments, etc ...,.
- Nanotechnology for energy needs
- Breakthrough's of nanotechnology in traditional industries: e.g. textile industry, construction engineering, agriculture and foodstuff's
- Familiarisation of nanotechnology in daily life

- Education model for nanotechnology in Europe
- Healthy promotion of nanotechnology in industry
- Nanotechnology: base for job creation
- Safe signalisation of nanotechnology applications for society, consumer and environment

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- Place of Europe's nanotechnology in the world
- Nanotechnology pan-European strategy
- Global nanotechnology collaboration

Marcel Van de Voorde.....Geneva, 16 April 2013