
Editorial

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Biographical notes: Leszek A. Dobrzański is the Director of the Institute of Engineering Materials and Biomaterials of the SUT Gliwice, Poland, President of World Academy of Materials and Manufacturing Engineering, Foreign Fellow of Ukrainian and Slovak Academies of Engineering Sciences, Editor-in-Chief of three worldwide journals, a Visiting Professor, an Invited Speaker, Chairman and a Member of the Programme Committees of the serial scientific conferences in numerous world countries, an author or a coauthor of ca.1000 publications, ca.40 patents, ca.40 scientific books, a laureate of numerous scientific distinctions, including William Johnson and Albert Schweitzer Gold Medals.

The condition of the achievement of fast and broad development by many countries, especially of the European Union ones is knowledge-based economy in which real richness including economical effectiveness, economy competitiveness and new workplaces is connected not only with the production of material goods and also with manufacturing, but also with transfer and use of knowledge. Knowledge-based economy is able to cause sustainable development, create a greater number of permanent and innovative workplaces and characterised by the greater social unity, featured with the fast development of those branches of economy which are connected with information, transformation and the development of science, branches of industry numbered among high technology and also technology and services of the information society. In economy, such a source of competitive dominance of most of the companies, including those small and medium ones are knowledge-consuming undertakings. The application of new engineering materials, new materials processing technologies including nanotechnology, ensuring the development of many fields, increase in improvement of life conditions and protection of natural environment belongs to the areas significantly deciding the development in that range and, on the other hand, developing, thanks to that. The introduction of new materials and the improvement of materials properties produced so far requires the outworking and the implementation of new methods of manufacturing and processing responsible for quality improvement and for the decrease of production costs. The knowledge and further familiarisation with numerous phenomena especially in a nanometrical and an atomic scale and taking place in an exceptional short time of femtoseconds enable the adjustment of materials properties including nanostructured ones to the requirements raised by their practical application. It deals also with nanostructured materials, the development of which becomes especially a dynamic one with relation to a great interest in nanostructural systems and observed intensive development of nanotechnology.

The central objective of nanotechnology understood as molecular manufacturing is the design, modelling and manufacturing of systems that can inexpensively fabricate most products that can be specified in a molecular detail. The choice of priority directions of the development of science and technology also in the area of the nanotechnology with a big participation of scientists, businessmen, representatives of public administration, non-governmental and social organisations and politicians, taking into consideration the possibility of the development of knowledge-based economy requires the constant verification of the foresight method being systematic and future reaching information and enabling formulation of directions and priorities of medium-and long-period developmental visions connected with current decisions and activities. It is foreseen that till 2013, the mastering of technology in a nanometrical scale can concern a huge group of products conditioning their market success. The development of nanotechnology also called molecular manufacturing or molecular nanotechnology, can be used in the nearest future, for example, for manufacturing chemical catalysers, new kinds of medicines dosed in a way not applied so far, to miniature constructions of electronic, mechanical and electromechanical devices, and also in surface engineering, ceramics and polymer technology. Nanostructured materials have different mechanical, electrical, magnetic and optic properties than conventional ones. The application possibilities of an avant-garde and promising group of materials, the application of which are set in various fields are developed. Nanostructured materials achieve an important meaning and technology of their production and application is getting strong in the industry. Nanotechnology is a promising and precious way of control of environment friendly manufacturing by small and big structure designs having complex properties.

It is necessary to expect the development of avant-garde technology and materials in the nanoscale extracts and the competitive development of materials treated at present as classic ones. There is no doubt that in the case of properties and costs in any of technical applications of classic, engineering materials, it turns out to be economically groundless, it is just that group which stops to develop itself for the advantage of new and avant-garde materials. It concerns mainly nanostructured materials.

The discovery of new materials, processes and phenomena, including those which will be worked out in a nanoscale and the development of new, experimental and theoretical technologies and researches create new possibilities of the development of innovative engineering systems and materials including nanosystems and nanostructured materials. It is conducive to the increase in demand for a new multidisciplinary and systematic approach to manufacture new devices functioning unreliably, including micro – and nanodevices. It can be achieved only by the combination of ideas of various disciplines and systematic flow of information and people among research groups and also as results of education of new specialists oriented not only in conventional materials processing technologies, but also in the field of nanotechnologies, design, manufacturing, processing and application of materials and nanostructured systems. Surely, the nearest years and decades will bring new ideas concerning the application of those kinds of engineering materials in various fields of science and engineering, including nanostructured materials, nanostructures and nanosystems as new technological possibilities of creating, materials an atom after an atom on which researches are carried out at present very intensively, and as it should be foreseen, will be intensified very significantly in the future. Surely, time will bring more and more results of scientific researches in the field of nanotechnology.

Expected solutions in the field of the outworking of new engineering materials: including the nanostructured ones and new technologies of materials processes require also new methodological approaches to their design and empirical verification. Costly and time-consuming selection of chemical composition and manufacturing technology (synthesis) of those materials by trial and error successively gives way to the formalised mathematical or numerical modelling, not rarely with the use advanced artificial intelligence methods. An interdisciplinary point of contact on the one hand between materials engineering and surface engineering, and on the other hand, mathematical statistics, numerical methods, artificial intelligence and fuzzy logics is filled out. Multiscale modelling becomes more important. Results of traditional materials science researches require also other outworking with the use of computational methods, and almost all new scientific experiments and experimental researches are designed for the complementation of materials science databases. Before our very eyes, new scientific disciplines such as computational materials science and computational surface engineering have been created. The *International Journal of Computational Materials Science and Surface Engineering* has ambitions for that development, follow and register and even inspire and actively participate in it. It achieved outstanding supporters, that is, the *World Academy of Materials and Manufacturing Engineering (WAMME)* and the *Association of Computational Materials Science and Surface Engineering (ACMS&SE)*, which take the scientific patronage under that undertaking. The *IJCMSSE* is at the disposal of all interested in that attractive subject matter.

In the given, already fifth issue, we hand P.T. Readers a few new, I do hope, interesting papers dealing with that subject matter.