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Archives of Materials Science and Engineering

Editor-in-Chief Prof. Leszek A. Dobrzański

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as the organ of the Commitee of Materials Science
of the Polish Academy of Sciences

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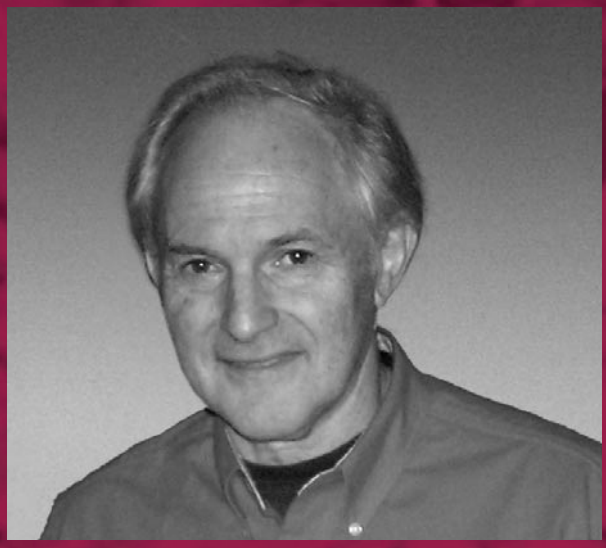
Gliwice

It was said...



Sir Prof. Harold W. Kroto

The Nobel Prize Winner in Chemistry 1996
for the discovery of fullerenes

"(...) I never dreamed of winning the Nobel Prize – indeed I was very happy with my scientific work prior to the discovery of C60 in 1985. The creation of the first molecules with carbon/phosphorus double bonds and the discovery of the carbon chains in space seemed (to me) like nice contributions and even if I did not do anything else as significant I would have felt quite successful as a scientist. A youngster recently asked what advice I would give to a child who wanted to be where I am now. One thing I would not advise is to do science with the aim of winning any prizes let alone the Nobel Prize that seems like a recipe for eventual disillusionment for a lot of people. [Over the years I have given many lectures for public understanding of science and some of my greatest satisfaction has come in conversations with school children, teachers, lay people, retired research workers who have often exhibited a fascination for science as a cultural activity and a deep and understanding of the way nature works.] I believe competition is to be avoided as much as possible. In fact this view applies to any interest – I thus have a problem with sport which is inherently competitive. My advice is to do something which interests you or which you enjoy (though I am not sure about the definition of enjoyment) and do it to the absolute best of your ability. If it interests you, however mundane it might seem on the surface, still explore it because something unexpected often turns up just when you least expect it. With this recipe, whatever your limitations, you will almost certainly still do better than anyone else. Having chosen something worth doing, never give up and try not to let anyone down."

A fragment of the autobiography written at the time of the award from Les Prix Nobel. The Nobel Prizes 1996, Editor Tore Frängsmyr, [Nobel Foundation], Stockholm, 1997; a photo made in Aveiro, Portugal on 8 September 2005

Editorial

In my paper concerning "Synergic effects of the scientific co-operation in the field of materials and manufacturing engineering" in Volume no 15 of the Journal of Achievements in Materials and Manufacturing Engineering I have written: "Since the 1950s materials engineering created in the meeting of some traditional fundamental and engineering science, continuing mainly the physical metallurgy traditions, which was created at the beginning of industrial revolution, converted next smoothly to materials technology and in consequence to the materials science. Links were developed simultaneously between materials technology and materials engineering, and applied sciences, which can be demonstrated by many examples. Investigations of semiconductors have provided the opportunity for co-operation with solid-state physics. The development of polymer materials demonstrated the effectiveness of co-operation with polymer chemistry. There are many examples of implementing numerous models discovered by physics and chemistry for the development of materials. Many mathematical models were used, among others, for describing phase transformations, conception of J integral in fracture mechanics, fractal geometry for describing growth of clusters and colloidal systems, for solving the nonlinear grain boundary migration problem or Laplacian growth processes in description of the morphological phase transformations. The end of the 20th century has demonstrated that achievements of materials engineering are usually an outcome of the significant integration among various branches of science, which resulted in consequence in making the 21st century materials science an interdisciplinary area developed on the crossroad of many pure science disciplines, mostly of the solid-state physics, chemistry, mathematics, and process engineering, but also mechanics and mechanical engineering, ecology, economy, management and applied computer science, and even biology and medicine, taking advantage of achievements of those scientific disciplines to propose materials with the most advantageous set of properties and suiting higher and higher requirements posed to products and goods used by people in the best way, in conditions of the fierce market competition and with high requirements concerning quality, reliability, life, and price.

The target of materials science is an investigation of the effect of their structure in various scales (electron, crystalline, micro, and macro) on properties of materials. A great number of material brands available nowadays offer new innovative possibilities in design, manufacturing, and implementing of products. The determination of dependencies among the structure, technological process, and functional properties, as well as materials selection and technological properties forming their structure and properties for employment in complex manufacturing systems feature the core interest of materials engineering.(...)"

The contemporary scope of interests of materials engineering is unusually broad – from metal alloys through ceramic, carbon, polymer to composite materials. Traditional materials and technologies including structural, engineering and tool ones and those which because of structure and application eg. for work in elevated temperature or cryogenic conditions and in the corrosion environment called so far special ones although in a bigger extent interests of those ones concern functional materials eg. designed for electronics and optoelectronics, smart and adaptive, biomimetic materials including classic ones and also nanostructural ones and connected with nanotechnologies. Those issues deal both with synthesis and processing of materials, their chemical composition and microstructure, phenomena and properties and connected with them analytic and research techniques, behaviour of materials in exploitation operating conditions and materials design and prediction of their durability and life-time.

During millenniums and also yet during 20th century materials were chosen and worked out by a process of trial and error as a matter of fact not guaranteeing an optimal solution because of a taken set of criteria and at the same time time-consuming and expensive one. At present the great emphasis is put on the development of methods of modelling of structure and materials properties and interrelations between them, conditions of manufacturing, processing and exploitation and the type of material and its chemical composition. Classic mathematical models, not only for statistically or even numerically are used using eg. finite elements or boundary elements methods and also the full set of artificial intelligence ones with neural networks, genetic algorithms or expert systems. Those methods gave basis for the intensive development of computational materials science as a new scientific specialisation in the field of engineering materials being intensively developing materials design, not requiring usually such a range of experimental works as traditional methods and very often leading to experimental verification of calculations or prediction made in the virtual computer reality.

All mentioned issues are in the orbit of interests of "Archives of Materials Science and Engineering". Materials engineering as a discipline of science develops significantly intensively nowadays and in its development and yet in a few other avangarde disciplines of science the biggest chances are seen in contemporary civilisational progress and raise the level of societies' life. Our Journal has ambitions and at the same time hopes to accompany and documenting that development. I think that it will attract to it the broad group of both Authors and Readers. I do count on the promotion of those achievements in many countries of the World by the presence of the Journal in scientific and national libraries and the activity of broad multinational Editorial Board and also members of the Committee of Materials Science of the Polish Academy of Sciences and organizers of important international scientific conferences which will take advantage of the possibility of the publication of proceedings of those conferences just in that Journal.

Directing to the Readers' hands the next volume of "Archives of Materials Science and Engineering" as a unit of the Committee of Materials Science of the Polish Academy of Sciences published yet again in the new form and format, I am convinced that it fulfills requirements both of Authors and Readers. I invite to active cooperation and co-creation of the Journal on which we do count as the editorial team. I am convinced that we will not be disappointed. So let it happen.

Prof. Leszek A. Dobrzanski Dr hc
Editor-in-Chief of the AMSE

Gliwice, in January 2007

Thematic scope of papers

MATERIALS

Metallic Alloys, Tool Materials, Superplastic Materials, Ceramics and Glasses, Composites, Amorphous Materials, Nanomaterials, Biomaterials, Multifunctional Materials, Smart Materials, Engineering Polymers

PROPERTIES

Ductility, Crack Resistance, Fatigue, Creep-resistance, Fracture Mechanics, Mechanical Properties, Electrical Properties, and Magnetic Properties, Corrosion, Erosion, Wear Resistance, Non-Destructive Testing, Reliability Assessment, Toxicity, Working Properties of Materials and Products

METHODOLOGY OF RESEARCH ANALYSIS AND MODELLING

Electron Microscopy, X-ray Phase Analysis, Metallography, Quantitative Metallography, Image Analysis, Computer Assistance in the Engineering Tasks and Scientific Research, Numerical Techniques, Statistic Methods, Residual Life Analysis, Process Systems Design, Mould Flow Analysis, Rapid Prototyping, CAM, CAMS, CAQ, Engineering Design, Technological Design, Materials Design, Computational Material Science, Materials and Engineering Databases, Expert Systems, Artificial Intelligence Methods

MATERIALS MANUFACTURING AND PROCESSING

Casting, Powder Metallurgy, Welding, Sintering, Heat Treatment, Thermo-Chemical Treatment, Thin & Thick Coatings, Surface Treatment, Machining, Plastic Forming, Quality Assessment, Automation Engineering Processes, Robotics, Mechatronics, Technological Devices and Equipment, Theoretical Fundamentals of Cleaner Production, Industrial Application of Cleaner Production Methods, Production and Operations Management, Production Planning and Control, Manufacturing Technology Management, Quality Management, Environmental Management, Safety and Health Management, Project Management, Physical Distribution and Logistics Management, Supply Chain Management, Productivity and Performance Management

EDUCATION AND RESEARCH TRENDS IN MATERIALS SCIENCE AND ENGINEERING

Development of New Curricula for BSc, MSc and PhD Studies, Challenges of the Widening Labour Market, Complementary Roles of Developed and Developing Nations in Promoting a Global Industrial and Economical Infrastructure and Requirements on Common International Research and Teaching Development, Computer Aided Teaching, E-learning

Only papers positively pre-reviewed by at least two reviewers are published in the journal.