

Reviews on Advanced Materials Science

Volume 5, Number 3, December 2003

Proceedings

**of the International Conference
NANOMATERIALS AND NANOTECHNOLOGIES
(Crete, Greece, August 30 – September 6, 2003)**

Part III

edited by Ilya Ovid'ko

Russian Academy of Sciences

St. Petersburg, Russia

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PREFACE

The International Conference "NANOMATERIALS AND NANOTECHNOLOGIES" (Crete, Greece, August 30 – September 6, 2003) provided a dynamic overview of current multidisciplinary research on nanostructured materials and development of nanotechnologies with the primary focus on reinforce of connection between the fundamental science, engineering and commercialization of nanostructures; between universities, governmental laboratories, academic institutions, private research sector and industry. The main aim of the Conference was to assess the current status and to identify future priority directions of fabrication, research, design and applications of nanocomposites, carbon nanotubes, self-assembled supramolecules, nanostructured bulk solids, films and coatings, quantum dots and wires. This issue of Reviews on Advanced Materials Science Journal is the third one of five issues containing selected papers presented at the Conference.

This issue will be of interest to researchers and graduate students in the field of nanostructured materials science and nanotechnologies. It can be also useful for engineers who are involved in production and processing of nanostructured materials for functional and structural applications.

I would like to greatly acknowledge the significant contribution of the international organizing committee: E.C. Aifantis (Greece), M.-I. Baraton (France), G.-M. Chow (Singapore), M.Yu. Gutkin (Russia), J.Th.M. De Hosson (The Netherlands), G. Kiriakidis (Greece), E. Lavernia (USA), C.S. Pande (USA), H.-E. Schaefer (Germany), S. Seal (USA), R.D. Shull (USA), G. Skandan (USA), V. Teixeira (Portugal) and T. Tsakalacos (USA). Special thanks are to Maria Prodromitis and representatives of Advanced Study Center (St. Petersburg, Russia), Creta Maris Hotel (Crete) and Select Travel Agency (Heraklion, Crete) for making the Conference a successful and smoothly running meeting.

The support of this Conference by Advanced Study Center (Russia), European Office of Aerospace Research and Development, Air Force Office of Scientific Research (USA), United States Air Force Research Laboratory, National Science Foundation (USA) and University of Central Florida (USA) is gratefully acknowledged.

Ilya Ovid'ko
Chair, International Conference "Nanomaterials and Nanotechnologies – 2003"
Institute of Problems of Mechanical Engineering, Russian Academy of Sciences
St. Petersburg, Russia

September 19, 2003

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[1] R. Birringer, H. Gleiter, H.P. Klein and P. Marquardt // *Phys. Lett.* **102** (1984) 365.

[2] F.R. Nabarro, *Theory of Crystal Dislocations* (Clarendon Press, Oxford, 1967).

[3] V. Provenzano, In: *Nanostructured Materials: Science and Technology*, ed. by G.-M. Chow and N.I. Noskova (Kluwer, Dordrecht, 1998), p. 335.

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