

Reviews on Advanced Materials Science

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**Proceedings
of the 2nd International Conference
NANOMATERIALS AND NANOTECHNOLOGIES
(Crete, Greece, June 14 – 18, 2005)**

Part V

**edited by Ilya Ovid'ko
Russian Academy of Sciences
St. Petersburg, Russia**

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Reviews on Advanced Materials Science provides an international medium for the publication of reviews, topical issues and international conference proceedings in the area of theoretical and experimental study of advanced materials. Focuses are placed on, but not limited to nanostructured materials, semiconductors and materials for hydrogen economy. We encourage prospective authors to correspond with the Editor-in-Chief before submitting a review article. Proposals should include an outline with key citations. All papers submitted will be rigorously peer-reviewed prior to publication. **Reviews on Advanced Materials Science** is published in both paper and electronic versions.

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PREFACE

The 2nd International Conference "Nanomaterials and Nanotechnologies" (Crete, Greece, June 14 - 18, 2005) 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 (RAMS) Journal is the fifth 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), 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), S. Seal (USA), R.D. Shull (USA), G. Skandan (USA), B. Straumal (Russia), V. Teixeira (Portugal), T. Tsakalakos (USA), M. Upmanyu (USA).

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Ilya Ovid'ko

Chair, 2nd International Conference "Nanomaterials and Nanotechnologies – 2005"
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REFERENCES

[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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