

Reviews on Advanced Materials Science

Volume 15, Number 1, September 2007

**Proceedings of the Symposium
"Nanostructured Composite Films:
Synthesis, Characterization,
Properties and Applications"
(Warsaw, Poland, September 4-8, 2006)**

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PREFACE

This volume is the first of free issues presenting the Proceedings of the Symposium A entitled "Nanostructured Composite Films: Synthesis, Characterization, Properties and Applications" which was held at the Fall Meeting of the European Materials Research Society (E-MRS) in Warsaw, Poland, September 4-8, 2006. This symposium brought together more than 80 participants. The emphasis was placed on various aspects related to the synthesis, chemical deposition, physical deposition, characterization, structure of composite films as well as physical properties of films such as mechanical, tribological, optical, electrical and magnetic properties of films and applications of films for sensors and devices.

This symposium attracted 77 contributions of which 9 were invited, 34 were presented as oral contributions and 34 as posters. This volume is composed of 37 refereed papers dealing with recent results on major topics covered by the symposium. The participants to the symposium "A" worked very actively, with high regular attendance at oral and poster sessions.

The invited talks presented by David Babonneau (University of Poitiers, France), Martin Balden (Max-Planck-Institut, Garching, Germany), Albano Cavaleiro (University of Coimbra, Portugal), Ihsan Efeoglu (Ataturk University, Erzurum, Turkey), Francesco Gonella (University of Venice, Italy), Pantelis Kelires (University of Crete, Heraklion, Greece), George Kiriakidis (University of Crete, Heraklion, Greece), Paweł Kulesza (University of Warsaw, Poland) and Sanjay Mathur (University of Saarbruchen, Germany) were related to "Structure and magnetic properties of C/FePt granular multilayers prepared by ion-beam sputtering", "Indentation testing of thermally nano structured metal-containing carbon films", "Nanocomposite transition metal (TM)-dichalcogenides sputtered self-lubricating coatings alloyed with carbon", "Mechanical and tribological properties of multilayered-composite solid lubricant films", "Metal nanocluster composite silicate glasses", "Atomistic simulations of nanocomposite carbon films", "Nanostructured metal oxide thin films for gas sensors", "Electrocatalysis and bioelectrocatalysis and nanostructured composite films", "Protective and bio-compatible nanostructured surfaces by CVD techniques: controlled modulation of surface and phase structures", respectively.

We thank the invited speakers and contributors for the oral and written work devoted to the presentation of papers. Much gratitude is due to the editorial team of the journal "Reviews on Advanced Materials Science" as well as to other persons who contributed with their work, in one way or another, to the success of this E-MRS 2006 Fall Meeting.

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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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