

Advanced Materials

Editors

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ADVANCED MATERIALS

Proceedings of the Indo-Malaysian Joint Workshop (WAM-2002)

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In Collaboration with

SIRIM Berhad, Malaysia

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FOREWORD

With the advent of advanced materials, scientific and technological breakthrough in diversified field of materials science have led to significant improvements in almost all sectors of engineering applications. Several advanced processing and characterizing techniques have also emerged to utilize these scientific and technological innovations. The advanced materials also enabled the material scientists to think in different directions, which were not possible earlier. In the new millennium, the advanced materials are not only emerging as promising engineering materials, but have also opened up newer frontiers in Research and Development.

The National Metallurgical Laboratory, Jamshedpur, India has been instrumental in the development of a wide range of advanced materials that include the Ni-free nitrogen steel (Thakaron), superalloys, nano-crystalline ceramic powders, high temperature ceramics (borides, carbides, nitrides and in-situ composites), amorphous and magnetic ribbons, high energy product magnetic materials etc. The workshop on "Advanced Materials" organized by the National Metallurgical Laboratory, Jamshedpur, India in collaboration with the Advanced Research Centre-1, Hyderabad, India and SIRIM Berhad, Malaysia is understood to be the first step towards mutual understanding and interactions of different research organizations of both the countries.

The response received from the acclaimed experts in advanced materials from India and Malaysia has been tremendous. The workshop volume contains a large number of papers dealing with future of advanced materials in the new millennium. I wish to thank all the authors from the academic institutes and R & D organizations for their response and valuable contributions in bringing out this proceeding. I am hopeful that this volume will immensely benefit the fraternity working on advanced materials.

S. P. Mehrotra

Director

National Metallurgical Laboratory

Jamshedpur

EDITORIAL

Materials play an important role in the advancement of science and technology. Over the years significant progress has been made in materials technology through tremendous and continued efforts for the betterment of the society. As a result, new classes of advanced materials have emerged with significantly improved properties. Recent developments have focussed on the nano-phases as well as nano-materials, composite materials, intelligent materials, magnetic materials, sensors, structural ceramics, bulk amorphous alloys etc. The key sectors, where the demand for advanced materials are in communications (optical fibers, high density recording, lasers, non-linear optical materials, superconductors), energy (new batteries, hydrogen storage, fuel cells and solar energy materials), transportation (composites and structural materials), super hard materials and sensors.

The India-Malaysia Joint Committee for S&T Co-operation constituted in March 2001 decided to hold a series of seminars and workshops in the areas of mutual interest during the next two years. The idea is to exchange technical know-how, sharing R&D experience and to understand the research problems that are being faced by India and Malaysia. It was decided by the joint committee that a workshop on advanced materials would be beneficial for the researchers of both countries. In this context, a workshop "Advanced Materials" was finalized and being a frontier research institute in this area, the National Metallurgical Laboratory (Council of Scientific & Industrial Research), Jamshedpur, India had organised the India-Malaysia Joint Workshop on "Advanced Materials" (WAM-2002) during 12-13 March, 2002 in collaboration with the Advanced Research Centre-I, Hyderabad and SIRIM Berhad, Malaysia. The international workshop was sponsored by the International Division, Department of Science and Technology, Government of India, New Delhi and the International Science & Technology Affairs Directorate (ISTAD), Council of Scientific & Industrial Research (CSIR), New Delhi, India.

The proceedings of the present workshop contain the papers that were presented during the event. The articles included in the book focuses on the demand for advanced materials, which appears to be in various sectors like energy, aviation, defense, electronic etc.

We take this opportunity to express our sincere thanks to the Department of Science & Technology (DST), New Delhi; Council of Scientific & Industrial Research (CSIR), New Delhi; National Metallurgical Laboratory, Jamshedpur; Advanced Research Center (International), Hyderabad for their financial support and for providing infrastructure facilities to conduct the workshop. Malaysian Research institutes showed keen interest in sending their delegates for this workshop. We also express our sincere thanks to Dr. R.A. Mashelkar, FRS, Director General, CSIR; Prof. V.S. Ramamurthy, Secretary, DST; Prof. P. Ramachandra Rao, formerly Director, NML and Dr. R.N. Ghosh, Sr. Deputy Director, NML for their support. The co-operation extended by Dr. Y.P. Kumar, Adviser & Head and Shri C.R. Murthy, Director, International Division (DST), Shri Sudhir Kumar, IAS, Jt. Secretary & Head (ISTAD),

CSIR, New Delhi; Dr. G. Sundarajan, Director, ARC (I), Hyderabad; Dr. Azmi Idris General Manager, SIRIM, Malaysia are sincerely acknowledged. Our special thanks to Prof S.P. Mehrotra, Director, NML for his encouragement and kind permission to publish this proceeding. We are thankful to many of our colleagues at NML for their help in organizing the workshop. We are especially thankful to members of WAM-2002 organizing committee for their sincere efforts in making the workshop a grand success. Assistance rendered by Shri Asim Sarkar of M/s Samudran, Jamshedpur for composing the proceedings is gratefully acknowledged.

The workshop on "Advanced materials" has not only initiated a dialogue between Indian and Malaysian scientists, but also discussed their views and ideas in the field of advanced materials. Many research scientists, engineers and academic staff from Indian institutions have largely benefited by attending this workshop. We hope that this event would certainly lead to collaborative research work between the two countries and exchange of scientific personnel in future.

L. C. Pathak
K. Venkateswarlu
Amitava Bandopadhyay
Ajoy Kumar Ray

VIII

CONTENTS

<i>Foreword</i>	v
<i>Editorial</i>	vii
1. Nanoembedded Materials : A Canvas For New Materials Design	1
<i>Kamanio Chattopadhyay and Victoria Bhattacharya</i>	
2. Nanopowders and Nanocrystalline Materials	12
<i>R. Sundaresan</i>	
3. Mechanical Alloying for the Production of Nano-Structured Structural Materials	24
<i>Abdul Kadir Masrom</i>	
4. Quasicrystal Forming Ability of Zr-Based Alloys	40
<i>B.S. Murty, D.H. Ping and K. Hono</i>	
5. Synthesis of Nano-Crystalline Ceramic Powder By Chemical Process	55
<i>L.C. Pathak, T.B. Singh and Ajoy Kumar Ray</i>	
6. Composite and Nanomaterial Research At Universiti Sains Malaysia	70
<i>W.A.K. Mahmood, G.L. Teoh, H.P. Choo, K.Y. Liew and H. Liu</i>	
7. Hydrothermal Synthesis and Microstructural Control of Hematite Particles	92
<i>K.K. Sahu</i>	
8. Superalloy : Processing and Performance	97
<i>R.N. Ghosh</i>	
9. Self-Propagating High-Temperature Synthesis (SHS) of Advanced High Temperature Materials	107
<i>S.K. Mishra and L.C. Pathak</i>	
10. Development and Characterization of Ag-Cu-Ti Alloys for Ceramic Brazing	121
<i>Sudipta Mondal, L.C. Pathak, K. Venkateswarlu, S.K. Das and Ajoy Kumar Ray</i>	

11. Modelling of Elasto-Plastic Deformation and Crack Propagation Studies in Thermal Barrier Coated Superalloys	129
<i>Ashok K. Ray and Nilima Roy</i>	
12. Metal Matrix Composites-A Journey of Four Decades	140
<i>S. Ray</i>	
13. Spray Processing of Particulate Reinforced Composites	160
<i>G.B. Rudrakshi, V.C. Srivastava and S.N. Ojha</i>	
14. Development of Aluminium Based Metal Matrix Composites	171
<i>K. Venkateswarlu, A.K. Ray, S.K. Chaudhury and L.C. Patil</i>	
15. Processing, Characterization and Evaluation of Biomaterial Based on Hydroxyapatite Reinforced Polyethylene Composites	181
<i>Z.A. Mohd Ishak, K.K.L. Lim and U.S. Ishiaku</i>	
16. Thin Films for Microsensors	196
<i>Muhammad Yahaya and M.M. Salleh</i>	
17. The Superconducting Materials	205
<i>S.K. Ghatak</i>	
18. Magnetoresistive Studies of Heterogeneous Alloys and Bulk Manganite Ceramics	216
<i>S.A. Halim, W.Y.W. Daud and K.P. Lim</i>	
19. R&D on Rechargeable Lithium-Ion Battery at AMREC	224
<i>Surani Buniran</i>	
20. Giant Magneto-Impedance Behaviour in Ferro-Magnetic Materials	229
<i>A. Mitra and A.K. Panda</i>	
21. Development of Nanocrystalline FeNbCuSiB Based Alloy for Sensor Application	235
<i>A.K. Panda, A. Mitra, I. Chattoraj, V. Rao, S.R. Singh and P. Ramachandrarao</i>	
Author Index	241