

Editorial

K. Byrappa · Tadafumi Adschiri

Published online: 21 February 2008
© Springer Science+Business Media, LLC 2008

We feel happy to bring out this 2nd edition of the Special section of *Journal of Materials Science*. The first one in this series was published as Volume 41, No. 5, 2006, and it was entitled “A Novel Method of Advanced Materials Processing,” with K. Byrappa and M. Yoshimura as Guest Editors. The scientific community realized the significance of novel routes of advanced materials processing through this special edition.

The present edition covers related topics with a focus on the applications of the novel routes as well. The novel routes of advanced materials processing in the current context cover hydrothermal, solvothermal, and supercritical fluid technologies. However, in the earlier days all these methods were dealt under hydrothermal technology. In the last 25 years or so, there is a distinct variation in understanding of each one of these processes. So accordingly in early 1980s chemists used the term solvothermal. Similarly in early 1990s the Green Chemistry had a great impact on the supercritical fluid technology as a more popular one. Today all the three distinct technologies are being used for advanced materials processing like materials synthesis, crystal growth, fabrication, recycling, waste treatment, effluent treatment, etc. Besides, these techniques have a special advantage for materials fabrication because of highly controlled diffusion. The greatest advantage of these novel routes is the control of size and shape for the

polyscale materials whether bulk, fine, or nanocrystals. These routes also provide desired surface properties to the materials through the introduction of surfactants, thus enabling us to make the materials either hydrophobic or hydrophilic. Such materials have a special advantage in biomedical applications like targeted drug delivery, hypothermia, neutron capture therapy, cancer therapy, etc. There are several other related terminologies like glycothermal, alchothermal, ammonothermal, carbonothermal, lyothermal, and so on. In general, the use of mineralizers is the most important issue here. Depending upon the type of mineralizer different terminologies are used. The use of these novel routes of advanced materials processing has been effectively tested for the preparation of materials like gallium nitride, zinc oxide, diamond, and so on. The know-how on the synthesis of these compounds is better understood today owing to their tremendous application potential. This is also due to better understanding of the solvent chemistry and modeling, which help greatly to intelligently monitor the processes. In comparison with the first edition of this series the present edition is an enlarged version covering broader aspects of science dealing with biomimetic, nature inspired processes, etc. The joint conference of the 8th International Symposium on Hydrothermal Reactions and 6th International Conference on Solvothermal Reactions held during August 5–9, 2006 discussed all these aspects in great detail and also led to the creation of an International Solvothermal and Hydrothermal Association (ISHA). Accordingly, in future ISHA will discuss all the developments of the novel routes of advanced materials processing and the ISHA conferences will be held once in every 2 years in different parts of the world. In the last joint conference held in August 2006, the following topics were covered: hydrothermal, solvothermal and supercritical fluid technologies, solution chemistry,

K. Byrappa (✉)
Mysore University, P.B. No. 21, Manasagangotri,
Mysore 570 006, India
e-mail: byrappak@yahoo.com

T. Adschiri
Institute of Multidisciplinary Research for Advanced Materials
(IMRAM), Tohoku University, 2-1-1 Katahira, Aoba-ku,
Sendai 980-8577, Japan

thermodynamics, phase diagrams, modeling, kinetics and diagnostics method, materials synthesis and processing of inorganic, organic, organometallic, metallo-organic, hybrid materials, crystal growth of bulk single and nanocrystals, and also thin films, chemical engineering, waste treatment, effluent treatment, alternation, novel materials, nanomaterials, nanotechnology, metallurgy, extraction and separation, technologically important materials, geothermal reactors, geological processes and systems, experimental mineralogy and petrology, nanohybrid materials, etc. We had received about 130 research articles for this special edition from all over the world covering all the above said topics. All the articles were subjected to peer review process as per the *Journal of Materials Science* format, and finally 62 well-written articles were selected for inclusion in this special edition.

This special issue begins with two review articles written by very senior researchers in this field like Prof. M. Yoshimura, Prof. G. Demazeau, and Prof. K. Byrappa, on the topics Hydrothermal Processing of Materials: Past, Present and Future; and Solvothermal Reactions: An Original Route for Synthesis of Novel Materials. These review articles give a complete picture covering every aspect of this science, and it is supported by the rest of the articles in

this special edition. We sincerely hope that this special edition will be a most valuable source of reading for the Materials Science community. The Guest Editors would like to acknowledge the valuable help rendered by all the seniors in our scientific community in reviewing the manuscripts in spite of their busy schedules. Our special thanks to Prof. M. Yoshimura, Prof. G. Demazeau, Prof. N. Yamasaki, Prof. Richard E. Riman, Prof. K.P. Yoo, Prof. Y.W. Lee, Prof. K. Yanagisawa, Prof. Edward Lester, Prof. S. Feng, Prof. T. Sato, Prof. T. Funazukuri, Prof. Takashi Naka, Prof. B. Basavalingu, Prof. K.M. Lokanatha Rai, Prof. S. Ananda, Prof. R. Somashekar, Prof. C. Ranganathiah, Dr. B.V. Suresh Kumar, etc. for their help in bringing out this special edition. Our thanks to our Secretaries Ms. Emi Isago, Ms. Hasegawa, and Ms. M.K. Padmashree for all the assistance in compiling this special edition. Our research students were of great help to us in handling this special edition. Also our thanks to Editor in Chief Prof. Barry Carter, who was in charge of this edition for his constant guidance and support in editing this special edition. Finally our special thanks to Ms. Katie Costello, Ms. Angela DePina, and Ms. Amiee DeSouza, of the Springer, USA for their constant cooperation and support in bringing out this special edition.