J Mater Sci (2010) 45:4255
DOI 10.1007/s10853-010-4453-0

EUROMAT 2009

Preface to the special issue "high-temperature joining"

Alberto Passerone · Pawel Zieba · Rajiv Asthana

Published online: 9 April 2010

Under the auspices of the European Congress on Advanced Materials and Processes (EUROMAT 2009), sponsored by the Federation of European Materials Societies, and held in Glasgow (UK) on September 7–10, 2009, two International Symposia titled Physicochemical Phenomena in Wetting and Adhesion and Technology and Characterization, were organized under the specific Conference Topic "Joining."

This premier event in Europe for Materials Science and Technology has seen, in particular, the basic principles and the technological aspects of joining processes examined in their diverse forms and implications.

In many branches of modern industry, be it power (conventional and sustainable energy sources), electronic, automotive, aviation, or chemical, it is necessary to create joints combining advanced materials (oxide-, carbide-, and nitride-ceramics, composites, FGM's, glasses, etc.) and metal alloys, of very complex shapes and consisting of many elements. Depending on the specific applications, they should also fulfill additional requirements such as resistance to thermal shock, to high temperatures, to wear and corrosion, to thermal fatigue and support higher rotation speeds, or other requirements. The choice of bonding technique, based on sound physico-chemical analyses, determines the properties of obtained joints.

The Symposia have succeeded in presenting the diversity and unity of scientific approaches to study the wetting and adhesion phenomena in high-temperature material systems across disciplines. A platform has been offered to present and exchange new scientific knowledge about the physicochemical aspects of wetting and adhesion in metal–metal, metal–ceramic, and ceramic–ceramic systems, in special relation to joining processes, as well as on the basic requirements that are usually formulated with reference to advanced materials joints.

This special issue collects the papers presented at the conference, reviewed in full compliance to the process followed for regular papers in Journal of Materials Science. The papers discuss fundamental and applied issues related to (1) thermodynamic, kinetic, and atomistic modelling; (2) wetting, spreading, and active brazing processes; (3) microstructural characterization of interfaces and joints; (4) ecological joining techniques (diffusion bonding, vacuum brazing, etc.); (5) modelling, numerical calculations, and measurements of thermal residual stresses; and (6) characterization of physical properties of joints (mechanical strength, wear resistance, corrosion resistance, thermal conductivity, fatigue strength, etc.).

We wish to thank all participants for their valuable contribution to the conference, both scientific and human. A special note of thanks is due Conference Secretariat (Ms. Melanie Boyce and Ms. Debbie Keogh) for their help and support with the preparations for the conference, as well as to the Editorial Staff of the Journal of Materials Science, for the timely and precise help and counseling in the preparation of this Special Issue.

A. Passerone (✉)
Institute for Energetics and Interphases, CNR, 16149 Genoa, Italy
e-mail: a.passerone@ge.ieni.cnr.it

P. Zieba
Institute of Metallurgy and Materials Science, Polish Academy of Sciences, Reymonta St. 25, 30-059 Cracow, Poland
e-mail: nmzieba@imim-pan.krakow.pl

R. Asthana
Department of Engineering and Technology, University of Wisconsin-Stout, Menomonie, WI 54751, USA
e-mail: AsthanaR@uwstout.edu