GUEST EDITORIAL

Alberto Passerone   **Robert Filipek**   **Fiqiri Hodaj**   **Maria Luigia Muolo**   **Natalia Sobczak**

The 2011 edition of the European Congress on Advanced Materials and Processing—EUROMAT, held in Montpellier (France) on September 12-15, 2011, has seen the participation of a very large number of scientists (more than 2700). One of the Topics was devoted to ''Joining'', split into two Symposia: ''Wetting, soldering and brazing'' and ''Diffusion bonding and characterization'' with about 100 Oral or Poster presentations. The Symposia have been organised around Keynotes, Highlights and contributed communications, and provided considerable opportunity for discussions, exchange of experience and ideas.

We are happy to present, in this Special Issue of JMEP, a collection of articles as invited submissions, selected from presentations belonging to the Topic ''Joining'', expanded from the original presentation and subjected to in depth peer review procedure.

The problem to create joints among different multi-component and multi-phase materials (metallic alloys, ceramics, composites, glasses, etc.) having complex shapes and size is a critical point in many branches of modern industry, e.g., power, electronic, automotive, aviation, space, chemical industries, and many others. The basic requirements are usually formulated with the reference to the joints in advanced materials and they include the maximum mechanical strength of the joint, vacuum tightness, precision of the formed joint and of the unit in which this joint occurs. Depending on the specific applications of designed joints, they should also fulfil additional requirements like resistance to the thermal shocks, high temperature, higher rotations, wear, corrosion at the elevated temperatures, etc. The choice of bonding technique determines the properties of obtained joints.

The papers presented here address phenomena ranging from the basic understanding of interfacial interactions to processing and performance evaluation. Indeed, the control of the joint interface is largely responsible for its intrinsic final strength. This can be accomplished by the study of the basic mechanisms governing the stability, reactivity, and integrity of materials, to obtain all the necessary input data for soldering and brazing processes, electronic packaging, and metal-ceramic composite production. In this respect, a large part of papers discuss issues related to thermodynamics and kinetics of interfacial interactions, wetting, spreading and active brazing processes, soldering by Pb-free alloys, and microstructural and microchemical characterization of the interfaces.

From the point of view of Processing and Applications, you will find here papers on the theoretical description of joining process and life time prediction, on the optimization of joining process, and on the characterization of physical properties of joints (mechanical strength, wear resistance, corrosion resistance, thermal conductivity, fatigue strength, etc.).

Finally, we wish to thank the Congress Chairs Jean-Marc Chaix and Livio Battezzati for their fundamental contribution to the Congress success. Dr. Rajiv Asthana, JMEP Editor and Mrs. Diane Whitelaw, Production Coordinator, have been supporting us in a very efficient and friendly way: to them and to all Reviewers we address our deep gratitude.

Alberto Passerone
Main Guest Editor, National Research Council-Institute
for Energetics and Interphases (CNR-IENI)
Genoa, Italy
e-mail: a.passerone@ge.ieni.cnr.it

Robert Filipek
Guest Editor, AGH University of Science and Technology
Kraków, Poland
e-mail: rof@agh.edu.pl

Fiqiri Hodaj
Guest Editor, Grenoble Institute of Technology (SIMaP)
Saint Martin d'Hères, France
e-mail: fhodaj@simap.grenoble-inp.fr

Maria Luigia Muolo
Guest Editor, National Research Council-Institute
for Energetics and Interphases (CNR-IENI)
Genoa, Italy
e-mail: ml.muolo@ge.ieni.cnr.it

Natalia Sobczak
Guest Editor, Center for High Temperature Studies,
Foundry Research Institute
Kraków, Poland
e-mail: nataliesobczak@interia.pl