Editorial

Filipe Samuel Silva* and Luís Augusto Rocha

School of Engineering,
Mechanical Engineering Department,
University of Minho,
Guimaraes, Portugal
Email: fsamuel@dem.uminho.pt
Email: lrocha@dem.uminho.pt
*Corresponding author

Alexandre da Costa Velhinho

Faculdade de Ciências e Tecnologia, FCT,
Universidade Nova de Lisboa,
Caparica, Portugal
Email: ajv@fct.unl.pt

Biographical notes: Filipe Samuel Silva received his MSc in 1996, and PhD in 2002, both at Minho University, and is Associate Professor since 2011 at the University of Minho on the Mechanics of Materials area. He works at the Center for Mechanical and Materials Technologies – CT2M, at Minho University, and his research interests include processing technologies and characterisation of FGMs – Functionally Graded Materials.

Luís Augusto Rocha is Associate Professor at Minho University on the Materials area. He works at the Center for Mechanical and Materials Technologies – CT2M at Minho University and is the Coordinator of the Functionalised Materials and Surfaces Performance group of CT2M. His research interests include processing technologies and characterisation of FGMs – Functionally Graded Materials, surfaces functionalisation and tribo-corrosion.

Alexandre da Costa Velhinho earned his PhD in Materials Science (Composite Materials) in 2004 from Universidade Nova de Lisboa, where he currently holds a position as Assistant Professor in Materials Science Department. He is also a permanent researcher at CENIMAT/I3N (Materials Research Center/ Institute for Nanostructures, Nanomodelling and Nanofabrication), and external researcher at CT2M (Centre for Mechanical and Materials Technologies). His research interests are focused on the concept of functional gradation, particularly when applied to foams and metal-matrix composites, comprising modelling and experimental work in the fields of processing (e.g. centrifugal casting, friction stir processing, freeze casting and severe plastic deformation) and material characterisation, namely through synchrotron radiation microtomography.

Functionally Graded Materials (FGM) are a sub-domain of Bio-inspired materials in which properties change gradually with position within the component. The gradient in properties results from intentionally-induced variations in chemical composition and/or

structure in selected regions of the material. Careful design of the spatial gradation is of prime importance. Very often, the absence of a smooth gradient causes severe interfacial mismatches of physical, chemical and/or mechanical properties, resulting in degraded component's performance. Although in the last decade significant research efforts have been undertaken in order to understand and model the influence of the enormous number of parameters dictating the performance of FGMs, and to develop/improve the processing techniques for these materials, only limited examples in functionally graded bulk materials are known, which are clearly far beyond the potential importance of such materials. The reason lies on the fact that an interdisciplinary understanding of basic mechanisms like: processing, phase equilibria, physical and mechanical characterisation, among others, is necessary. In this respect, the modelling of some of these issues has not even started. Taking all this into account, this special issue intends to contribute to advance the state-of-the art regarding FGM materials.

With that in mind, some international experts in the field contributed to this issue, and an International Conference, '11th International Symposium on Multiscale, Multifunctional and Functionally Graded Materials' that was held in Minho University in September 2010, was also promoted, from which some of the most valuable contributions were also added. The result is this special issue with papers covering FGM production and characterisation, modelling of the behaviour of such materials, and applications. This issue provides therefore a forum for scientists, researchers and application and design engineers working in the field of FGMs.