

## Preface

## Electrophoretic deposition: Fundamentals and applications

The 3rd “International Conference on Electrophoretic Deposition: Fundamentals and Applications” was held in October 2008 in Hyogo, Japan, under the auspices of Engineering Conferences International (ECI). This was the third conference of this series, which focuses entirely on electrophoretic deposition (EPD), after the previous conferences held in Canada (2002)<sup>1</sup> and Italy (2005)<sup>2</sup>. The main goal of the conferences is to provide a forum for discussion among scientists and technologists from varied disciplines on the subject of EPD both from the fundamentals and the application points of view. This conference series has succeeded in drawing together representatives of the different scientific and technology fields where EPD plays a fundamental role as a key processing and fabrication technique.

In recent years, the huge potential of EPD as a processing method for the realisation of unique micro- and nanostructures and novel material combinations has been recognised by the materials science community. This fact has led to a significant increase of the volume of high quality and innovative EPD related research worldwide. Considering that the basic mechanisms involved in EPD have been extensively investigated, there is however general agreement in the scientific community that further research efforts are required to develop a full and quantitative understanding of the fundamental mechanisms of the process of deposition. In this regard, EPD methods based on optimised working parameters are being developed which are leading to a broader range of applications of EPD in materials processing. This is especially the case when, for example, multicomponent suspensions are used with the aim of fabricating complex or composite micro- and nanostructures. Classical and emerging application areas for EPD are the low-cost fabrication of composite

materials including advanced functional coatings, nanocomposites, laminate structures, functionally graded materials, porous materials, nanocrystalline heterostructures, piezoelectric materials, fibre-reinforced ceramics, bioactive coatings and carbon nanotube layers. EPD is also an advantageous technology for the manufacture of small-scale, near net-shape objects having accurate dimensions (micro- and nano-manufacturing). The technique is also attractive to manipulate and process nanomaterials (nanoparticles, nanofibres, nanotubes, nanosheets) being thus a significant tool in nanotechnology.

In terms of outcomes of the last conference, it became clear that some areas, specifically related to predicting EPD kinetics and quantification of deposition mechanisms, need further attention and closer collaboration and effective interaction with the electrochemistry community is expected. For example, despite the numerous improvements of the EPD technique and the large range of applications achieved, there is need for further theoretical and modelling work to develop predicting tools useful to guide new EPD developments. It has been pointed out that many experimental studies are carried out using unsatisfactory and time-consuming trial-and-error approaches, due to the lack of available quantitative correlations between EPD parameters and final deposit properties. In view of the continuous success of this conference series and the interest generated in the EPD community it is intended to hold a fourth conference in 2011 in Mexico. Further details about the next conference may be obtained from the address below.

Authors who presented papers at the conference last year, dealing specifically with the application of EPD as core technique for the processing of traditional or new ceramic materials and composites, were invited to participate in the present special issue of the *Journal of the European Ceramic Society*. The

17 papers in this issue are a representative selection of research being carried out worldwide in the field, with papers both covering fundamentals of the EPD technique, as applied in materials science, and those showing specific examples of application of the technique in a wide range of materials and new systems.

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## References

- [1].“Electrophoretic deposition: fundamental and applications”, The Electrochemical Society, Pennington, US, 2002.A. R. Boccaccini, O. Van der Biest

and J. Talbot, ed., *Proceedings of the International Conference on Electrophoretic Deposition*, 2002.

- [2].Electrophoretic deposition: fundamental and applications II, Special Volume of the journal “Key Eng. Mater.” vol. 314, 2006.A. R. Boccaccini, O. Van der Biest and R. Clasen, ed., *Proceedings of the 2nd International Conference on Electrophoretic Deposition*. Trans Tech Publications, Zurich, 2005.

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