Depth profile analysis: coatings and thin layers

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Coatings and thin films are present in an amazing number of applications in our daily lives although in many cases we are not conscious of them. The field extends from protective layers for mechanical and corrosion resistance to multilayered materials for electronic, optoelectronic, or magnetic applications, coated glasses for buildings, biomaterials, photovoltaic devices, catalysts, sensors, imitation jewellery, and decorative coatings. Moreover, polymeric coatings are now also used for various technological applications, ranging from poly-LED displays or organic photovoltaic systems to food packaging.

The ability to carry out the in-depth profile analysis of a given material, i.e., to determine the changes in the composition of major and trace components from the surface down to the bulk homogeneous solid, provides information about the composition and thickness of the layers, the distribution of doping constituents, possible diffusion processes, and the presence of impurities. The depth-resolved analytical data allow us to better understand the processes occurring at nanometer-length dimensions and to improve the materials, with the aim of achieving the optimum final performance.

The rapid progress in materials science constantly poses new challenges for analytical chemistry and prompts the development of improved techniques and methods. The influence is particularly strong for coated materials and thin films, for which applications and demands are increasing at a rapid pace, with thinner films and more complex surface modifications continually being developed both to fit common market needs and also for high-tech applications.

This special issue contains 15 papers (four reviews and 11 original research papers) from universities, institutes, and research laboratories working with direct solid analytical techniques such as X-ray photoelectron spectroscopy, grazing incidence X-ray fluorescence, confocal Raman spectroscopy, glow discharges coupled with optical emission or mass spectrometry, and atomic force microscopy. The contributions show the potential for improved analytical techniques and methods to adapt their performance to the new challenges brought by materials science, for example, expanding their capabilities from just elemental to also molecular information, allowing the analysis of thin films of a few nanometers instead of just micrometer-thick coatings, assisting the development of advanced materials of proper quality, allowing for nondestructive depth profile analysis, and providing not just qualitative but also quantitative depth profile information.

We specially thank the authors for their contributions and wish them all the best in their professional lives. We are also very thankful to the reviewers for the thorough and on-time reviews of the papers, and, last but not least, to the editorial team of *Analytical and Bioanalytical Chemistry* for the invitation for us to act as guest editors of this issue and for their support.

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Beatriz Fernandez carried out her Ph.D. research at University of Oviedo (Spain), working on new quantification methods based on glow discharges for nonconducting materials and liquids. This was followed by a two-year postdoctoral appointment in the group of Olivier Donard at the Multidisciplinary Institute of Environmental Science and Materials in Pau (France) to work on new methods for the analysis of trace elements in solids using laser

ablation inductively coupled plasma mass spectrometry in combination with isotope dilution. Since September 2008, she has had a prestigious Juan de la Cierva research contract at University of Oviedo. Her main scientific interests are related to optical and mass spectrometry techniques for the direct analysis of materials.

Rosario Pereiro has been Associate Professor at University of Oviedo (Spain) since 1996. Following the completion of her Ph.D. degree in 1991, she was awarded a postdoctoral fellowship allowing her to spend 14 months working in Gary Hieftje's research group at Indiana University (USA). Her current research interests include developing novel analytical strategies for elemental and molecular in-depth profile analysis of thin layers, and

investigation of new strategies to improve the selectivity and sensitivity of molecular luminescence by using nanostructured sensing phases, such as molecularly imprinted polymers and quantum dots. She has coauthored more than 100 scientific papers and several patents.