

Green extraction techniques 2015

Elena Ibáñez and Alejandro Cifuentes (CIAL-CSIC)

Among the Green Analytical Chemistry framework, defined by L.H. Lawrence as “the use of analytical chemistry techniques and methodologies that reduce or eliminate solvents, reagents, preservatives and other chemicals that are hazardous to human health or the environment and that may also enable faster and more energyefficient analysis without compromising performance criteria”, extraction is one of the key steps, since it affects the whole analytical methodology, so it can have an important contribution to the greenness (or lack of greenness) of the whole analytical process. This Special Issue on Green Extraction Techniques 2015 is, therefore, the logical continuation of the Special Issue of TrAC edited by M. de la Guardia on Green Analytical Chemistry five years ago, which remains fresh, readable and citable.

In the past five years, there have been important advances in the development and applications of green extraction techniques. These advances demand updated reviews to keep the readers informed about all the novelties in such techniques. The original aim that moved us to prepare this Special Issue of TrAC was to present topof-the-line review papers from experts in the field, showing technologically and methodologically innovative strategies in the different fields to make extraction techniques greener and more sustainable, together with the current trends and applications of advanced analytical techniques and methods in Green Extraction Techniques.

The result is this Special Issue that contains 24 review papers that cover what we believe are key topics and applications on Green Extraction Techniques, namely:

- 1 their role in Green Analytical Chemistry (M. de la Guardia)
- 2 recent advances and future trends of new materials in sample preparation (F.M. Lanças)
- 3 the use of pressurized liquid extraction and supercritical fluid extraction to obtain functional ingredients from plants, seaweeds, microalgae and food by-products (M. Herrero)
- 4 pressurized hot water extraction of bioactives (C. Turner)
- 5 pressurized liquid extraction of organic contaminants in environmental and food samples (Y. Pico)
- 6 preparative gas chromatography as green sample preparation technique (L. Mondello)
- 7 green sample-preparation techniques in comprehensive twodimensional gas chromatography (L. Mondello)
- 8 volatile sampling by headspace techniques (A.C. Soria)
- 9 ultrasound as a clean, green and environment-friendly extraction technology (B. Tiwari)
- 10 ultrasound-assisted extraction of emerging contaminants from environmental samples (J.L. Tadeo)
- 11 microwave-assisted extraction of emerging pollutants in environmental and biological samples (M. Llompart)
- 12 green sample-preparation methods using room-temperature ionic liquids for the chromatographic analysis of organic compounds (C.F. Poole)

13 solvent-free extraction techniques of food and natural products (F. Chemat);
14 the evolution and applications of the QuEChERS method (M.A. Rodríguez-Delgado)
15 recent advances and developments of matrix solid-phase dispersion (A. Laganà)
16 recent trends in the use of single-drop microextraction (J.M. Kokosa)
17 recent advances of in-tube solid-phase microextraction (P. Campins-Falco)
18 stir-bar sorptive extraction (J.M.F. Nogueira)
19–21 three critical reviews of the state of the art of solid-phase microextraction of complex matrices, including environmental analysis, food analysis and bioanalytical and clinical applications (J. Pawliszyn's group)
22 recent advances in the combination of microextraction techniques for sample pretreatment (A. Moreda-Pineiro)
23 the latest trends in the miniaturized treatment of solid samples (L. Ramo)
24 coacervate-based extraction techniques (A. Melnyk)

As Guest Editors of this Special Issue devoted to Green Extraction Techniques 2015, we would like to thank all the authors for their suitable contributions, all reviewers for the time they devoted to evaluating the papers, Alex Crawford for his constant help and support, and to those of TrAC team who contributed their effort to preparing this Special Issue.