Green foodomics: new discoveries in a long journey

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Since its first definition in 2009 [1], interest in Foodomics has greatly increased thus showing the great adoption of the discipline as a framework to assess several important aspects in food science and nutrition, such as those related to food safety, quality, production and processing, novel foods development and the binomial food-health, among others. Foodomics covers different fields of research included in food science approached using advanced -omics technologies and associated to sustainability. At present there is an enormous interest in providing new answers to one of the main societal challenges: sustainability. Many aspects can be considered in this framework, ranging from the rational use of resources to the modern concept of biorefinery involving biomass conversion processes and equipment to produce fuel, power, and added-value chemicals from organic material. Considering this framework, Green Foodomics attempts to contribute to the greenness, sustainability and ecology of Foodomics as a whole. Among the different possibilities that can help foodomics moving towards a cleaner scientific discipline, the replacement of toxic solvents for green solvents with lower environmental impact, the design of new biorefinery processes and the intensification and integration of processes are involved in both, the extraction of bioactives from natural sources (such as plants, algae, food by-products, among others) that can be used as food ingredients, and the necessary sample preparation steps to determine the chemical composition of the natural extracts (that should follow the green analytical chemistry (GAC) principles).

In this sense, new challenges researchers are facing are the development of fast, selective, efficient, sustainable, green methodologies and processes, providing also with high yields and at lower costs. Methods able to meet these requirements are, among others, those based on the use of compressed fluids such as supercritical fluid extraction (SFE), gas-expanded liquids extraction (GXLs), pressurized liquid extraction (PLE) and subcritical water extraction (SWE). In this presentation, new ideas will be presented related to the use of compressed fluids acting as switchable solvents in methods (and processes). A switchable solvent is a solvent that can be reversibly converted from one form to another differing both in one or more physical-chemical properties (high dielectric constant-low dielectric constant, hydrophobic-hydrophilic, high ionic strength-low ionic strength) upon application or removal of a trigger. In the particular case of compressed fluids' based technologies, CO2 can be considered a green trigger since it is readily available, has low price and low environmental impact, it can be easily removed without leaving toxic residues. Therefore, it fulfills the Green Chemistry Principles. In this presentation, different applications involving the development of green extraction methods (mainly based on compressed fluids) will be presented with the idea of moving from "small to big" (or viceversa) for the extraction and characterization of bioactive compounds from natural sources.

[1] A. Cifuentes A. Journal of Chromatography A **43** (2009) 7109-7109.