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# HIGH RESOLUTION FAST-CHROMATOGRAPHY COMBINED WITH ENHANCED MASS RESOLUTION: TOOLS FOR IMPROVING LC-MS/MS METHODS IN ENVIRONMENTAL AND FOOD ANALYSIS

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In recent years, high performance liquid chromatography (HPLC) has experienced important developments, specially promoted by analytical laboratories that demand an enhancement on productivity, an increase in sample throughput and a reduction in analysis time. This resulted in the introduction of many useful approaches to perform fast or ultra-fast separations with analysis times lower than 5 min. In this context, LC systems have reduced their dead volumes to prevent losses on efficiency and the detection systems have increased their acquisition speed to be compatible with the ultra high resolution fast chromatographic separations. Additionally, since nowadays confirmatory information is demanded for most of the determination methods developed, mass spectrometry has become an indispensable tool in most of the analytical laboratories. In the last few years considerable emphasis has been placed to improve mass spectrometry instruments in order to provide instruments robust enough for routine analysis with fast acquisition rates and high mass resolution. Enhanced mass resolution (0.1-0.05 Th) is currently enough to improve signal-to-noise ratios and to avoid false positives or negatives in the analysis of low molecular weight organic contaminants.

Examples of the different strategies to perform high resolution fast chromatography separations on sub-2 $\mu$ m particle size columns and/or on fused core technology columns will be presented and discussed. Analytical methods for several environmental contaminants (bisphenol A related compounds, dialyldimethylammonium chloride, etc.) and hazardous compounds in foods (heterocyclic amines, veterinary drugs, ink photoinitiators, etc.) will be commented and the use of high pressure (UPLC) and high temperature LC in front of new surface porous supports that operate at backpressures lower than 400 bar will be discussed. Advantages and disadvantages of the different approaches will be commented. Finally, high resolution fast-chromatography coupled to mass spectrometry will be also discussed making emphasis in the requirements for a good performance. Examples will show how mass accuracy can help for confirmation purposes and how enhanced mass resolution allows to improve selectivity improving the detection limits and avoiding false positives and false negatives.

## References:

- E. Barcelo-Barrachina, E. Moyano, M.T. Galceran, J.L. Lliberia, B. Bago, M.A. Cortes, *Journal of Chromatography A* 1125 (2006) 195-203
- H. Gallart-Ayala, E. Moyano, M.T. Galceran, *Journal of Chromatography A* 1208 (2008) 182-188
- X. Esparza, E. Moyano, M.T. Galceran, *Journal of Chromatography A* 1216 (2009) 4402-4406
- A. Martinez-Villalba, E. Moyano, M.T. Galceran, *Rapid Communications in Mass Spectrometry* 23 (2009) 1255-1263