Innovative Multidimensional Chromatographic Systems Applied to the Analysis of Fats and Oils

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Single column chromatographic procedures are widely applied in the analysis of complex lipidic matrices. Although such approaches often provide satisfactory results, the complexity of many samples exceeds the separative capacity of any monodimensional system. As a consequence, in the past years considerable research has been dedicated to development of multidimensional techniques with the aim of enhancing resolving power.

The employment of automated dual-column comprehensive chromatographic methods in all fields is gradually increasing. This is due to the fact that these techniques are characterized by a much higher peak capacity as compared with single column and classical (heart-cutting) multidimensional approaches.

A typical comprehensive analysis is achieved, generally, on two independent columns connected by means of a special transfer system located between them. The type of interface used is linked to the specific methodology (comprehensive GC, comprehensive LC, etc.). The function of the transfer system is to isolate and then “inject” continuous primary column fractions onto a fast second dimension. In order to achieve comprehensive analysis and to preserve the 1D resolution, the bands injected onto the secondary column must undergo elution before the following 2D analysis. During the development of each 2D separation, the interface is engaged in the following isolation process.

The present lecture gives a brief overview of two of the most important and widely-used comprehensive chromatographic methods, namely comprehensive GC and LC. Technical/practical aspects relative to each approach and a series of applications on fats and oils of varying complexity will be described. Particular emphasis will be layed upon the outstanding resolving power, the formation of 2D group-type patterns and the benefits of introducing a third MS analytical dimension to such systems.