



COMPREHENSIVE TWO-DIMENSIONAL GAS CHROMATOGRAPHY (GC×GC) AND TIME OF FLIGHT MASS SPECTROMETRY (TOF-MS) PRINCIPLES AND INSTRUMENTATION

Comprehensive two-dimensional gas chromatography, or GC×GC, is a relatively new form of chromatography in which every peak eluting from the first column is subjected to a very fast separation on a second column with a different stationary phase. In this way two dimensional separations are obtained where peaks that coeluted on the first column are separated on the second. This gives the technique a unique separation power. Additional advantages include an improved sensitivity and group-type selectivity. It is this latter feature that makes GC×GC ideal for MOSH/MOAH separations. The saturated species can be separated from the unsaturated or aromatic ones. Because the peaks generated in GC×GC are extremely narrow, very fast detectors are needed. Peak

widths can be as low as 0.2 seconds at base-line, requiring detectors that have scan rates of 100Hz or more. This is not a problem for the flame-ionization detector (FID), but it requires the use of fast scanning time-of-flight (ToF) mass spectrometers. With such devices scan rates as high as 500Hz can be obtained. In ToF-MS devices short pulses of ions are shot into a flight tube and the time it takes for the ions to reach the end of the tube is measured. Lighter ions travel fast and have a relatively short flight time whereas the heavier ions require longer to traverse the tube. The principles and optimization of ToF MS analysers and their combination with GC×GC will be discussed with special attention for the compromise between scan speed, sensitivity and mass resolution.

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Principles and Instrumentation
of GC×GC and TOF-MS

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