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# HYPHENATED GC TECHNOLOGIES FOR THE ANALYSIS OF LARGE AND POLAR MOLECULES: TAKING GC OUT OF ITS COMFORT ZONE?

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Gas chromatography (GC) and liquid chromatography (LC) are complementary yet at the same time competing techniques. GC is generally faster and provides a higher separation efficiency. LC, on the other hand, requires less sample preparation, provides a better selectivity and has a much wider application range. Because for GC compounds need to have sufficient vapour pressure, GC is usually not considered in case of analytical questions relating to large and/or polar molecules. New derivatisation methods and developments in the area of high temperature GC have expanded the applicability of GC for higher MW or more polar compounds. A real quantum leap in the use of GC, however, came from the realisation that the properties of large molecules might still be present in their building blocks. In that way questions regarding large molecules can be transferred into small-molecule problems.

Trying to understand the behaviour and properties of polymers via studies of smaller products derived from them is not new. Pyrolysis GC and thermochemolysis (pyrolysis with *in-situ* derivatisation) have been around for decades. With recent developments in sample introduction techniques these methods now, however, can be used reliably also in a routine setting. Moreover, automation opens new routes for hyphenated and comprehensive couplings of LC separation modes that separate the intact large molecules and GC methods that focus on degradation products. Comprehensive separations performed '*intact* × *in pieces*' provide truly detailed information. In the presentation we will discuss recent directions in our and others' research in this area. GC might not be the first technique to think about when dealing with large and polar molecules, but thanks to recent progress the technique now really feels confident also if applied in this more exotic application field: as a stand-alone technique and coupled to its sister technique LC.

Comprehensive LC × GC with intermediate pyrolysis or thermochemolysis allows detailed characterisation of large polar and non-polar molecules. In the first dimensional LC separation the excellent selectivity of LC can be exploited. Moreover, the LC dimension acts as an efficient sample preparation step prior to GC. GC on the other hand provides highly detailed separations of the products formed upon thermal treatment in the modulator. Applications of various set-ups for LC × GC will be shown. These include studies of polymeric materials as well as applications from life sciences and in particular metabonomics.