THERMODESORPTION- AND STATIC HEADSPACE-GC-MS AS TOOLS IN POLYMER ANALYSIS – POTENTIAL AND PITFALLS

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Headspace gas chromatography (HS-GC) is nowadays the state-of-the-art system for the analysis of volatile substances. In the earliest headspace examinations, gaseous samples were directly introduced into the GC system. The spectrum of potential analytes could be enlarged using adsorption traps like in solid phase micro extraction (SPME). Detection limits could be significantly reduced with the development of dynamic HS techniques. Hereby, the analytes are stripped off by a continuous stream of gas, focussed by adsorption or condensation (achieved via cryofocussing), and subsequently released into the GC system by raising the temperature. The latter variant is being referred to as thermodesorption (TDS)-GC.

Amongst the various regulatory methods utilizing static HS-GC are screening techniques for volatile analytes in soil, sediments, wastewater, and polymers, such as vinyl chloride monomer in polyvinylchloride [1]. Also the volatiles from polyolefins are being quantified by static HS-GC and TDS-GC. Especially the automotive industry highly promoted the integration of determination of volatiles in polymer producers' quality management. They had to cope with the problem that volatiles from the cars' interior condensed on the windows, causing the highly undesired so-called fogging. To avoid fogging, standard procedures were elaborated to determine the compounds being volatile under various conditions and limits were fixed.

Fundamental research on the origin of these volatile substances necessitates quantitative methods of analysis. Therefore, the potential of static HS-GC and TDS-GC methods was evaluated with respect to detectable analytes, repeatability and linearity. In the course of these experiments, pitfalls of HS techniques in polymer analysis were identified and recommendations for different analytical tasks are deduced.

Literature:
[1] Static Headspace-Gas Chromatography – Theory and Practice, B. Kolb, L. S. Ettre, 2nd edition, John Wiley & Sons, Inc., Hoboken, New Jersey 2006, p. 13