FAST ON-LINE TOBACCO SMOKE ANALYSIS WITH PHOTO IONISATION - TIME-OF-FLIGHT-MASS SPECTROMETRY

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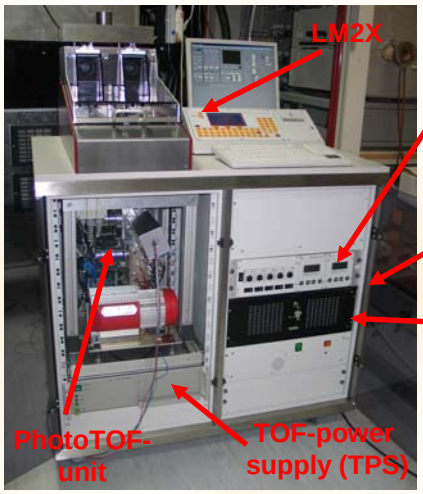
Introduction

The chemical properties of tobacco smoke are changing very rapidly during the smoking process. A real time analysis is required to better understand the chemistry of smoking. Puff-resolved analysis of tobacco smoke by conventional off-line analysis methods often is difficult and time-consuming. For fast puff-resolved on-line real-time measurements of the tobacco smoking process, time-of-flight mass spectrometry (TOFMS) with soft photo ionisation offers the capability to record simultaneously several compounds at high time-resolution and precision.

Instrumentation

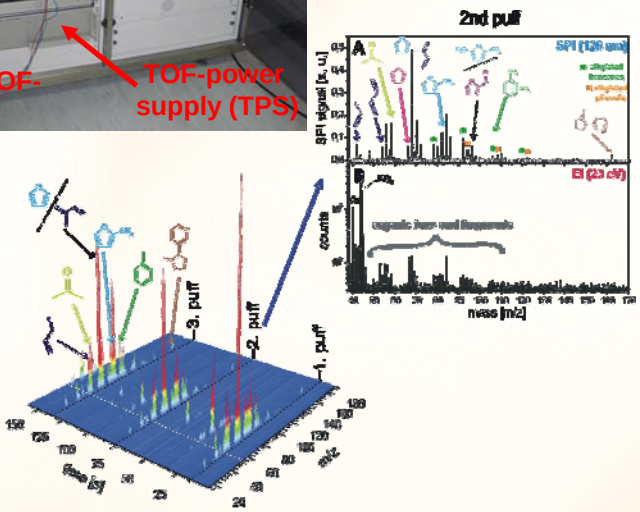
2-channel Borgwaldt KC LM2X smoking machine with integrated electron-beam-pumped excimer lamp (EBEL)-based SPI-oa-TOFMS-Analyser (right)

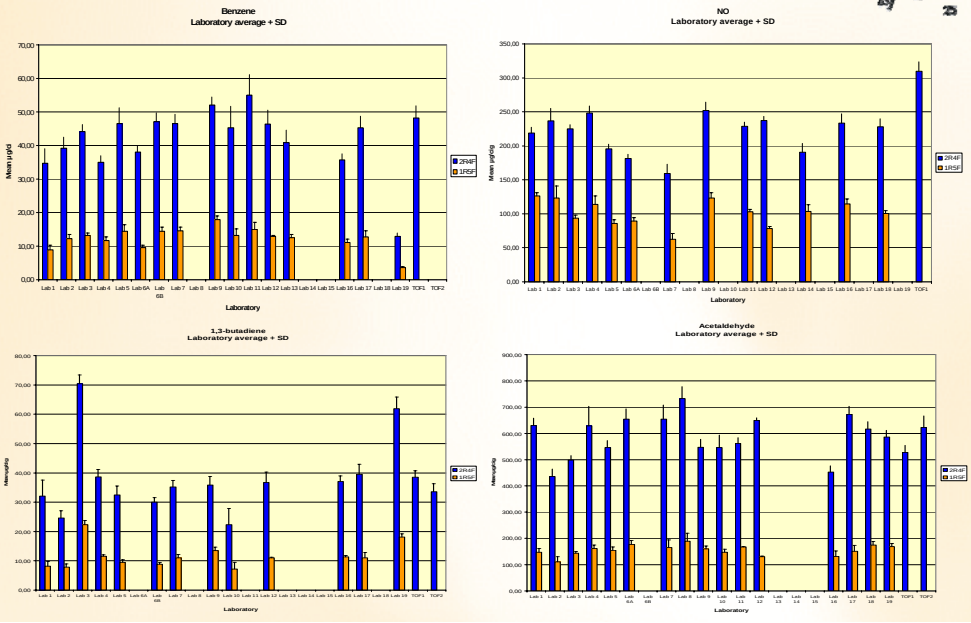
The two channels can be operated simultaneously (on-line analysis and conventional Cambridge filter sampling for reference offline-analysis). The whole instrumentation is build into two rugged 18 HU 19" racks installed into a movable housing. The instrument carries all necessary equipment for hardware control, data acquisition and data analysis and provides connections for the gases crucial for operation (compressed-air, inert-gas).



Results

The three dimensional plot shows a puff resolved measurement of the gas phase smoke of a 2R4F cigarette (right, first three puffs are shown). Various Hoffmann analytes such as butadiene, isoprene and benzene are detectable along with homologue rows of unsaturated hydrocarbons and aldehydes. With SPI-TOFMS, aliphatic hydrocarbons and carbonylic compounds are accessible with almost no fragmentation. In contrast, electron impact with 23 eV shows bulk components and many fragments.





Exemplary quantitative results on selected Hoffmann analytes obtained by the PhotoTOF analyser compared with results found by a Coresta SATF interlaboratory test 2006 (left).

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