

COMPREHENSIVE TWO-DIMENSIONAL GAS CHROMATOGRAPHY COUPLED TO TIME-OF-FLIGHT MASS SPECTROMETRY FOR THE ANALYSIS OF VAPOUR PHASE MAINSTREAM CIGARETTE SMOKE

Benjamin Savareear¹, Radoslaw Lizak¹, Jean-Francois Focant¹, Michal Brokl², Christopher Wright²

¹ Organic & Biological Analytical Chemistry Group - University of Liege, Allée du Six Août, 11, 4000 Liege, Belgium

² British American Tobacco, Southampton, SO158TL Southampton, United Kingdom

A comprehensive two-dimensional gas chromatography coupled to time-of-flight mass spectrometry (GC × GC-TOFMS) method has been developed for the analysis of vapour phase mainstream smoke. Analytical method development includes two parts: (a) optimisation of sample preparation and introduction, and (b) optimisation of chromatographic separation. For method development purposes the mainstream smoke from reference cigarettes (Ky3R4F) was collected under ISO smoking regime. The particulate phase of mainstream smoke was collected on a standard Cambridge filter pad. The vapour phase of mainstream smoke was collected on a gas (Tedlar) sampling bag and sampled by solid-phase micro extraction (SPME) or thermal desorption (TD) tubes. Moreover, the mainstream of vapour phase smoke directly trapped on TD tubes was also evaluated. Six different SPME fibres and six different TD tubes were tested. A further comparison was conducted between SPME and TD analysis in terms of the reliability and the number of volatile organic compounds detected in vapour phase smoke. For chromatographic optimisation a convex Hull Delaunay Triangulation approach was utilised to identify the best GC × GC column set. The qualitative and semi-quantitative analysis of mainstream vapour phase smoke along with method validation will be presented. In addition, the comparative advantages and disadvantages of SPME and TD sampling and the optimisation of GC × GC parameters for the analysis of vapour phase cigarette smoke will be discussed.