

# **Thermal desorption comprehensive two-dimensional gas chromatography coupled to low and high resolution mass spectrometry for the analysis of vapour phase sample from cigarette smoke and Tobacco Heating Product aerosol.**

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A new generation of tobacco (heat not burn) heating products (THP) as a potential “healthy” alternative to the conventional combustible and electronic cigarettes (e-cigarettes) were recently introduced [1, 2]. Such products can vary significantly from regular combustible products and have yet to be characterized, especially in terms of total aerosol chemical composition. In addition to high chemical complexity of the aerosol emissions over a large dynamic range, the presence of certain components at extremely high concentrations (e.g. glycerin, nicotine, triacetin) often leads to saturation of the MS detector and makes the evaluation of closely eluting constituents very challenging. In this context, we have developed an analytical method based on thermal desorption and comprehensive two-dimensional gas chromatography coupled to time-of-flight mass spectrometry and flame ionisation detection (TD-GC×GC-TOFMS/FID). The splitting of the flow between the detectors was achieved using a controlled flow splitter (CFT) with different lengths and diameters of capillary column to reach a 1:1 split ratio between FID and TOFMS, respectively. Finally, the TD-GC×GC approach was coupled to high-resolution time-of-flight mass spectrometry (HRTOFMS) to enhance the identification of compounds of interest. A comprehensive data mining strategy using linear retention indices, mass spectral match from low resolution and high resolution mass spectrometry, and accurate mass values aided unequivocal peak assignment of the sample. The results confirm the superior capability of the developed method in analyzing aerosol mixtures generated from tobacco heating products and demonstrate the relative simplicity of THP aerosols in comparison to mainstream cigarette smoke.

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[1] M.R. Smith, et.al., *Regulatory Toxicology and Pharmacology*, 81 (2016) S17-S26.

[2] R.R. Baker, *Prog. Energy Combust. Sci.* 32 (4): 373-385.