

Chemical Fingerprinting of Complex Samples With the Aid of Parallel Outlet Flow Chromatography

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Abstract : Speed of analysis is a significant limitation to current high-performance liquid chromatography/mass spectrometry (HPLC/MS) and ultra-high-pressure liquid chromatography (UHPLC)/MS systems both of which are used in many forensic investigations. The flow rate limitations of MS detection require a compromise in the chromatographic flow rate, which in turn reduces throughput, and when using modern columns, a reduction in separation efficiency. Commonly, this restriction is combated through the post-column splitting of flow prior to entry into the mass spectrometer. However, this results in a loss of sensitivity and a loss in efficiency due to the post-extra column dead volume. A new chromatographic column format known as 'parallel segmented flow' involves the splitting of eluent flow within the column outlet end fitting, and in this study we present its application in order to interrogate the provenience of methamphetamine samples with mass spectrometry detection. Using parallel segmented flow, column flow rates as high as 3 mL/min were employed in the analysis of amino acids without post-column splitting to the mass spectrometer. Furthermore, when parallel segmented flow chromatography columns were employed, the sensitivity was more than twice that of conventional systems with post-column splitting when the same volume of mobile phase was passed through the detector. These findings suggest that this type of column technology will particularly enhance the capabilities of modern LC/MS enabling both high-throughput and sensitive mass spectral detection.

Keywords : chromatography, mass spectrometry methamphetamine, parallel segmented outlet flow column, forensic sciences

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