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Detection of Indoor Ketones Using Ion Mobility Spectrometry with Air as Carrier Gas

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Indoor air quality is a critical factor in occupant health,safety and building performance, making it a key concern in civil engineering and sustainable construction. Volatile organic compounds (VOCs), particularly ketones such as 2-hexanone, 3-hexanone, 2-heptanone, and 3-heptanone, are commonly emitted from building materials and finishing products.

This study applies Ion Mobility Spectrometry (IMS) with corona discharge ionization (CDI) operated in positive mode for the rapid detection of these ketones. Vapors were generated from the headspace of a small, sealed bottle, diluted into a 1000 mL container, and introduced into the IMS using a syringe pump at a controlled flow rate of 100 $mL \cdot min^{-1}$ with air as the carrier gas. The IMS operated under the following conditions: drift tube length 11.93 cm, electric field intensity 670.6 $V \cdot cm^{-1}$, pressure 621 mbar, temperature 378 K, drift gas flow 600 $mL \cdot min^{-1}$, and shutter grid frequency 16 Hz.

Detection limits were below 50 ppb, demonstrating IMS capability for trace-level monitoring. Compared to chromatographic methods, IMS offers high sensitivity, sub-second response, and minimal sample preparation. These findings support IMS integration into smart building systems for real-time air quality assessment.

Keywords: Ion Mobility Spectrometry, Indoor Air Quality, VOCs, Civil Engineering, Sustainable Buildings.

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