

On the Concept Coupling of Molecular Rotational Resonance Spectroscopy with Gas Chromatography

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ABSTRACT

Currently, mass spectrometry (MS) rules the world of analytical chemistry. However, it is not easy to distinguish enantiomers, structural isomers, and isotopologues by MS, particularly if they co-elute during a chromatographic separation. A vast number of successful applications of gas chromatography-MS (GC-MS) exist to date. However, the development of new detection technologies is still highly important to keep pace with emerging needs in pharmaceutical, biochemical, and environmental analyses and gain ever-greater insight into complex samples. The concept of coupling gas chromatography with molecular rotational resonance spectroscopy (GC-MRR) was introduced in 2020, combining GC's separation capabilities with the unparalleled specificity of rotational spectroscopy. This presentation discusses the design and demonstration of the unique abilities of the prototype GC-MRR instruments. Although broadly applicable, its capabilities can exceed those of high-resolution MS and NMR spectroscopy in selectivity, resolution, and compound identification. Challenges associated with GC-MRR will also be discussed. Such an analytical tool will be indispensable for future compound-specific isotopic analysis or position-specific isotopic analysis.
