

A Transportable FTICR/MS for Direct and Real-Time Analysis of VOC Contaminants in Air and Water

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A transportable FTICR/MS has been developed based on a permanent Halbach magnet. The magnet is 1 to 1.5 T. The resolution is better than 0.03 Da in the 2-500 mass range. Ionization is conducted inside the ICR cell by ion-molecule reaction. Precursors for chemical ionization are chosen to achieve good selectivity towards specific compounds of interests and to avoid reactions with the molecules constituting the matrix (such as N₂, O₂ or H₂O). H₃O⁺ was shown to react with most volatile organic compounds, and CF₃⁺ with the halogenated compounds such as chlorofluorocarbons and hydrochlorofluorocarbons. Moreover, as reaction conditions are well controlled direct and reproducible quantification of molecules identified in the gas is possible. The transportable FTICR/MS, developed jointly at LCP and AlyXan, has proven useful for in-situ analysis of ambient gases. A few examples will be shown, such as analysis of exhaust fumes, polymer degradation and plasma analysis. A specific harsh environment FTICR/MS was developed by AlyXan for analysis in submarine atmosphere, to monitor contaminants of the air breathed in by the crew. More recently the FTICR/MS was associated to a membrane introduction system (MIMS) for water analysis. MIMS is used both as a barrier between the water sample and the vacuum cell and as a concentrator of the sample. The membrane showed enrichment factor of more than 1000 for volatile non-polar compounds and around or less than 10 for soluble compounds. A complex solution was studied, and the results will be shown.