

Performance-Enhanced “Tunable” Capillary Microwave Induced Plasma Mass Spectrometer for Gas Chromatography Detection

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Abstract

Improvements in the stability and performance of a capillary microwave induced plasma/mass spectrometer (MIP/MS) was achieved by optimizing power transfer to the cavity using a tunable coaxial MIP. The MIP, operating at atmospheric pressure, was sustained with 30 mL/min He and 60 W of power. Measurement precision and sensitivity for the standard waveguide and coaxial systems were determined using 16 organochlorine pesticide solution separated by gas chromatography (GC). The linear dynamic range obtained with the tunable MIP/MS extended over three orders of magnitude, a ten time improvement with respect to the standard MIP. Detection limits were between 3 and 19 pg/mole of Cl/sec, seven times lower than the detection limits obtained with the non tunable MIP/MS. Analysis of pesticides containing sulfur atoms was also possible, further demonstrating multielement MIP/MS detection. Excellent accuracy (10 % recovery) and precision (5 %RSD) was found for the detection of the pesticides in a petroleum contaminated reference soil. By placing the GC column at the plasma expansion stage, molecular fragmentation of a mixture of volatile organic compounds was also demonstrated. With the MS was operated in the selected ion monitoring mode, measurement sensitivity was ~ 500 pg/compound/sec.