

Micro Ion Trap Mass Spectrometry

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We have been exploring the use of cylindrical ion traps with fundamental dimensions of 1-mm diameter and smaller for mass spectrometry. These miniature ion traps have dimensions that are comparable to the thickness of the substrates used in microfluidic devices and their simple structure is amenable to microfabrication techniques. Operating voltages are lower than for conventional ion traps while RF frequency and working pressure are higher, making miniaturized electronics and vacuum systems possible as well. Mass resolution comparable to or better than for laboratory ion trap mass spectrometers has been demonstrated. The number of ions that can be stored in traps of equal energy depth scales as the radius of the cavity rather than the volume. This property makes two-dimensional arrays of small ion traps attractive for increased dynamic range. Prototype devices are being developed for environmental monitoring problems. Several examples of miniature ion traps, methods of sample ionization, mass analysis, and ion detection will be described.

Research sponsored by Office of Research and Development, U.S. Department of Energy, under contract DE-AC05-00OR22725 with Oak Ridge National Laboratory, managed and operated by UT-Battelle, LLC.