A Miniaturized Cylindrical Ion Trap Mass Spectrometer

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Miniaturization of an ion trap mass spectrometer is made possible, but only in part, by the miniaturization of the mass analyzer itself. Fundamental trapping parameters allow for the cylindrical ion trap to arguably be the simplest mass spectrometer to miniaturize. The applied voltage needed to create a trapping field and eject the ion population is proportional to the size of the ion trap. The rf power supply can therefore be miniaturized along with the mass analyzer. The number of collisions experienced by a given ion is minimized, as the ion's excursion is necessarily smaller. The ion trap can therefore operate at a higher pressure, alleviating the need for a powerful vacuum pump. Arguably then, the two largest components of an ion trap mass spectrometer, the vacuum system and the rf power supply, can simply be miniaturized by using a smaller cylindrical ion trap.

This lab has constructed a miniaturized mass spectrometer based on cylindrical ion trap technology. This system has a smaller vacuum system and a much smaller rf power supply, taking advantage of the factors mentioned above.