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Resitive glass drift tube used to inject externally formed ions into a submillimeter ion trap

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Novel Aspects: Ê The use of a resistive-glass drift tube to cool externally formed ions for capture and analysis in a portable <1mm cylindrical ion trap.

Introduction: Because of the difficulty to trap translationally hot ions in small ion traps, a need for a method to kinetically cool the ions is employed to inject ions externally into a 1mm cylindrical ion trap. Collisions with the neutral buffer gas is a well employed method for cooling ions; however it is not often used in controlling kinetic energy profiles. Because we will need a vacuum of less than 0.1 milliTorr for operation of the ion trap, the drift tube will be used at pressures below 1 Torr.Ê This leads to a large mean free path, increasing the diffusion of the ions, and producing poor separation resolution, but allows for discrete translational energy profiles.Ê

Methods: A mixture of C60 and C70 fullerite was deposited onto a probe tip.Ê Laser ablation with a N2 laser was employed to ionize the sample.Ê The sample was collisionally cooled in a 3", 0.125"ID, resistive glass drift tube at 0.5 Torr He.Ê We control the translational energy by varying the pressure and the applied field to the drift tube. The cooled ions were trapped and analyzed using a 1mm cylindrical ion trap.

Preliminary Results: We describe here how a drift tube can be used to control the translational kinetic energy of ions and control the energy distribution, so as to couple with a sub millimeter ion trap mass spectrometer.Ê We can control the translational energy by varying the pressure and the applied field to the drift tube. ÊWe have shown that discrete translational energy profiles can be achieved using a resistive-glass drift tube.Ê Analysis of the fullerite sample with the submillimeter cylindrical ion trap will be shown.

Keywords: submillimeter ion trap, laser ablation, ion mobility, drift tube.

Brief: Submillimeter ion trapping of externally formed ions using laser ablation coupled to a drift tube.