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A NEW LINEAR ION TRAP TIME-OF-FLIGHT SYSTEM FOR RAPID MS/MS

JENNIFER CAMPBELL, BRUCE COLLINGS AND DONALD DOUGLAS

Department of Chemistry, University of British Columbia,
2036 Main Mall, Vancouver, B. C., V6T 1Z1, Canada

A new system with a linear ion trap followed by a time-of-flight mass analyzer has been constructed and evaluated for MS/MS and MSⁿ. The instrument consists of an electrospray ion source and two radio frequency (rf) linear quadrupoles followed by a linear TOF. The pressure in the quadrupoles is typically 1-7 mtorr (N₂) to give collisional cooling of ions. Ions are trapped in a linear quadrupole by applying blocking potentials to aperture lenses at the entrance and exit. Ions can be excited by dipolar resonant excitation between a pair of rods of the quadrupole. This can be done with a broadband frequency "notch" waveform to eject all ions but one selected mass to charge ratio, followed by resonant excitation and dissociation of the isolated ion with a single frequency (MS/MS). Fragment ions are then mass analyzed in the TOF. At least 60% of precursor ions can be dissociated to fragment ions that are detected in the TOF. The process can be repeated to give MSⁿ. At the current state of development the resolution in isolating or fragmenting an ion is about 200 (FWHM). A complete MS/MS spectrum can be obtained in about 20 ms. In comparison to 3D Paul trap-TOF systems, this system is potentially more sensitive because the ion transmission into and out of the linear trap is nearly 100% efficient. In comparison to "Q-TOF" systems where precursor ions are isolated by mass selection in a linear quadrupole mass filter, this system again is of potentially higher sensitivity because precursor ions need not pass through a mass analyzing quadrupole. Representative spectra from reserpine, renin substrate teradecapeptide and cytochrome *c* showing the capabilities of the system will be presented.