Recent spectroscopic results from a new setup for the deposition of mass-selected ions in neon matrices are presented. Gaseous precursor substances are ionized in a homebuilt electron impact source, the ions extracted and deflected by 90° into a quadrupole mass filter with unity mass resolution up to 500 amu. The mass-selected cations are deposited simultaneously with an excess of electrons, to maintain overall sample neutrality and prevent buildup of space charges, and neon gas onto a reflective substrate held at 7 K.

Fourier-transform infrared spectra from such samples using cyanoacetylene and tetracyanoethylene reveal new infrared transitions for several cations. The strong infrared signal observed for the asymmetric stretch of CNC\(^+\) and the appearance of the corresponding band for CNC\(^{13+}\) in its natural isotopic abundance, demonstrates the sensitivity and usefulness of the apparatus. A combination band of CNC\(^+\) is also observed, revealing its low-frequency bend. Using this setup, the infrared spectra of cyanoacetylene ions\(^a\) (H(D)C\(_3\)N\(^+\) and C\(_3\)N\(_2\)^\(^+\)) and tetracyanoethylene ions and ionic fragments\(^b\) (C\(_6\)N\(_2\)^\(^-\), C\(_6\)N\(_4\)^\(^+\), C\(_7\)N\(_3\)^\(^+\), and C\(_8\)N\(_2\)^\(^+\)) are observed for the first time. The assignment of the numerous observed vibrations of these ions are well-supported by our density-functional calculations. Using this apparatus and the sensitive LIF technique, the assignment of a rich emission spectrum with origin near 440 nm is confirmed to be due to mass 88 or C\(_8\)N\(_2\) neutral\(^c\) as subsequently verified by a cavity ringdown measurement of Linnartz, Maier et al.