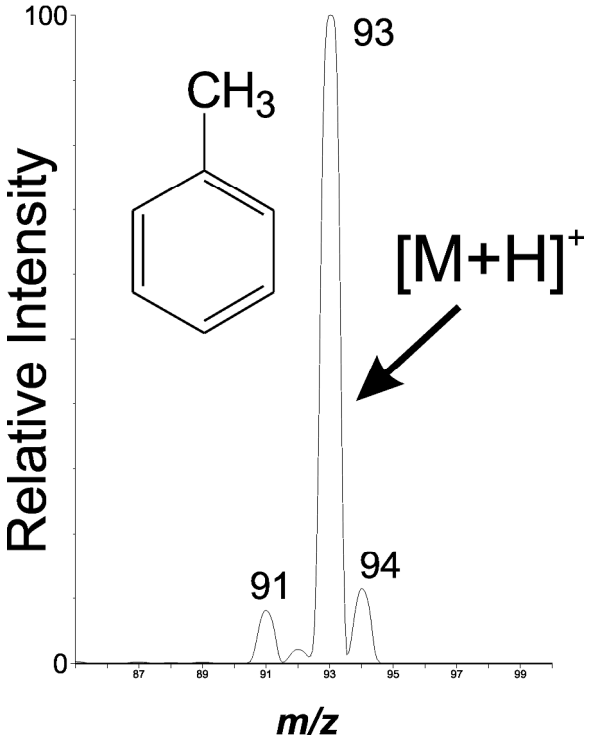
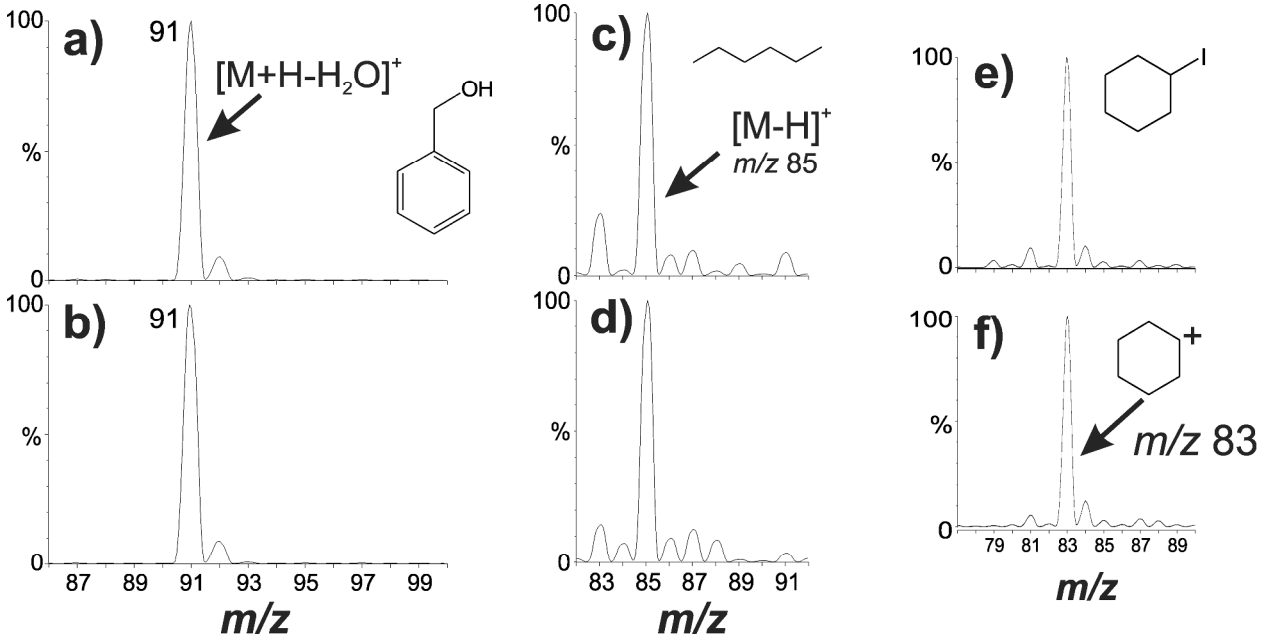
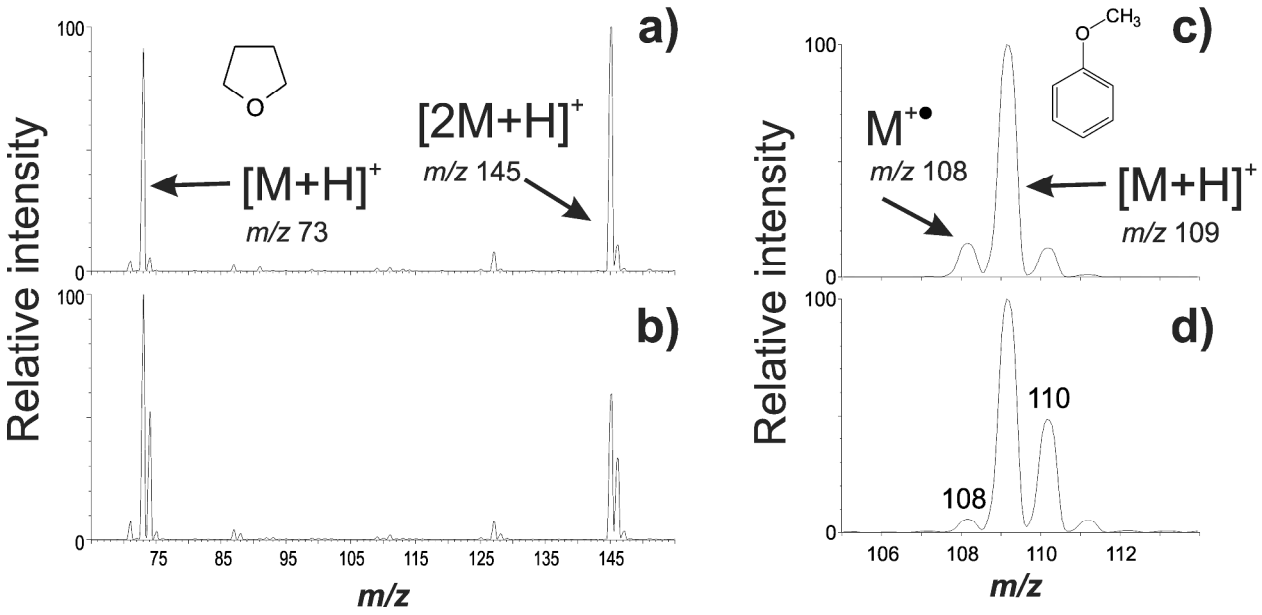
Supporting Information



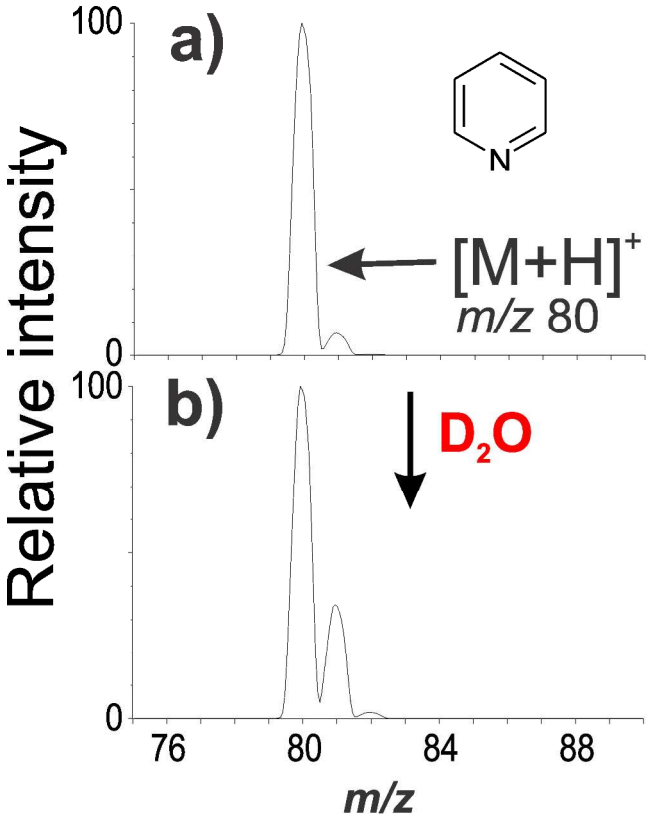
Supplementary Figure 1. Mass spectrum recorded from toluene (nominal mass = 92), under ambient conditions (open source) by exposing vapor emanating from a sample of liquid toluene placed in an open HePI source. Spectra (*m/z* 20 – 120) were acquired under multiple-channel analysis (MCA) conditions on a Quattro Ultima mass spectrometer.



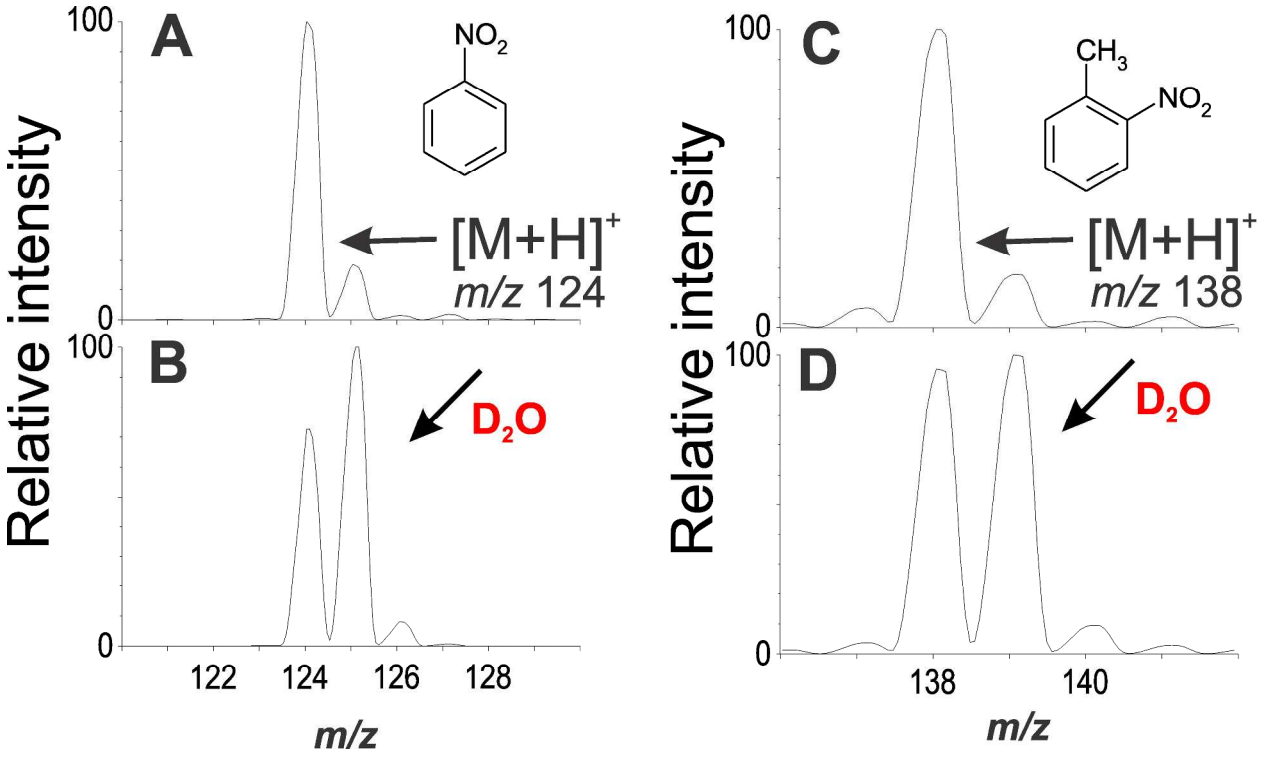
Supplementary Figure 2. HePI mass spectra recorded by exposing vapor emanating from a sample of benzyl alcohol (a), hexane (c), and cyclohexyl iodide (e). Spectra (*m/z* 20 – 120) were acquired under multiple-channel analysis (MCA) conditions on a Quattro Ultima mass spectrometer. Spectra b, d, and f were recorded after a cotton swab soaked in D_2O was inserted to the source



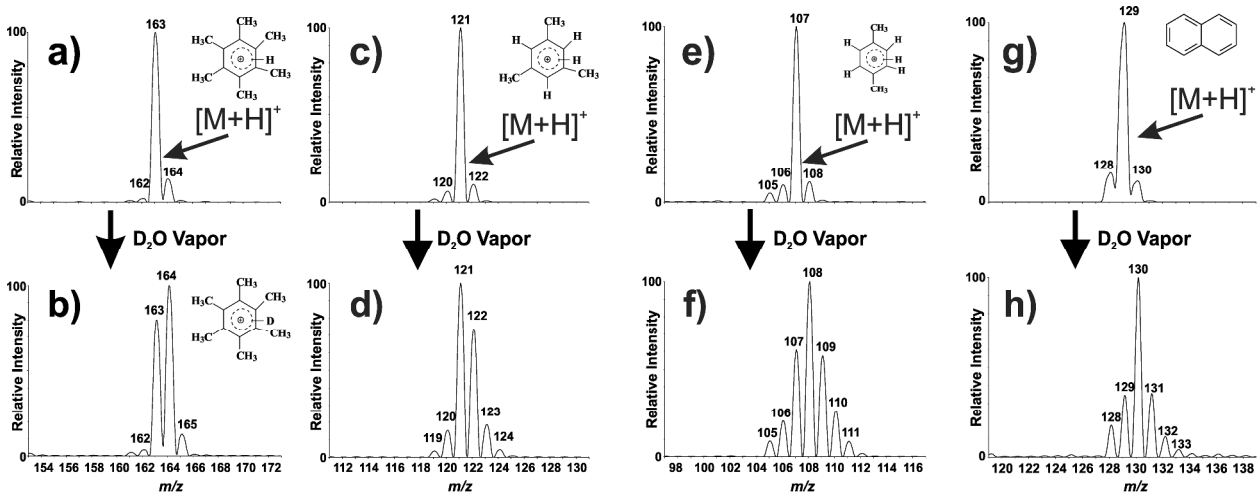
Supplementary Figure 3. HePI mass spectra recorded by exposing vapor emanating from a sample of tetrahydrofuran (a) and anisole (c). Spectra (*m/z* 20 – 160) were acquired under multiple-channel analysis (MCA) conditions on a Quattro Ultima mass spectrometer. Spectra b, and d were recorded after a cotton swab soaked in D_2O was inserted to the source



Supplementary Figure 4. HePI mass spectra recorded from pyridine before (a) and after (b) a cotton swab soaked in D_2O was introduced to the closed source.



Supplementary Figure 5. HePI mass spectra recorded from nitrobenzene (a) and *o*-nitrotoluene (b) samples placed in a closed source. After 20 seconds of data acquisition a cotton swab soaked in D_2O was introduced and spectra were recorded for further 2 min (c, and d).



Supplementary Figure 6. HePI mass spectra recorded by exposing vapor emanating from a sample of hexamethylbenzene (a), 1,3,5-trimethylbenzene (mesitylene) (c), *p*-xylene (e), and naphthalene (g) in a closed source. After 20 seconds of data acquisition, a cotton swab soaked in D_2O was introduced and spectra were recorded for further 2 min (b, d, f, h).