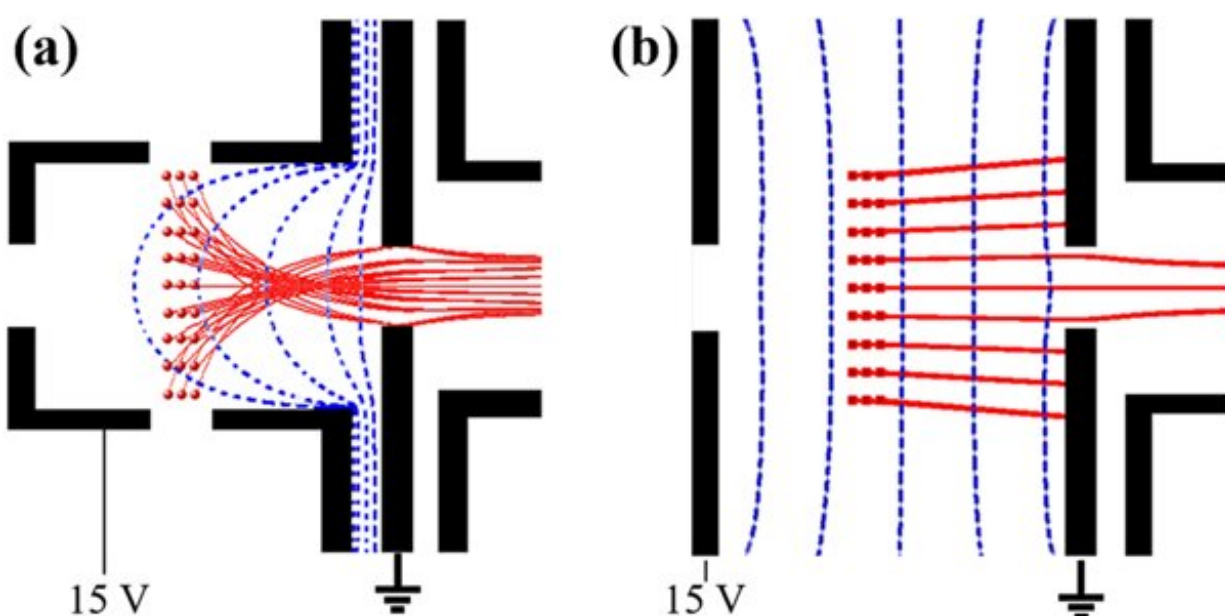


A vacuum ultraviolet photoionization time-of-flight mass spectrometer to analyze gas-phase radical reaction

May 19 2020, by Zhang Nannan



The simulated ion trajectories (a) in the cage-shaped focusing electric field and (b) in the traditional parallel electric field. Credit: WEN Zuoying

The research group led by Prof. Zhang Weijun at Anhui Institute of Optics and Fine Mechanics under Hefei Institutes of Physical Science has made new progress on the vacuum ultraviolet (VUV) photoionization mass spectrometry for gas-phase radical reactions.

VUV photoionization [mass spectrometry](#) has been widely applied in atmospheric and combustion chemistry for online detection of both stable molecular species and radicals.

As the ionization energies of most of molecules and radicals locate at around 10 eV, molecules and radicals can be softly photoionized with less fragmentation after absorbing the energy of VUV photons.

The research group have developed a compact VUV photoionization orthogonal acceleration reflection time-of-flight [mass spectrometer](#) (VUVPI-TOFMS), combined with a commercial VUV discharge lamp as [light source](#), for online analysis of radical reactions of atmospheric interest.

They designed a novel cage-shaped photoionization source and then formed a focusing electric field.

In addition, the team approached a very high sensitivity by the VUVPI-TOFMS. For example, the limit of detection of the VUVPI-TOFMS for the methyl radical has been achieved at 0.3 ppbv.

Meanwhile, several strategies have been employed such as an orthogonal acceleration configuration and a dual focusing [electric field](#) to increase the mass resolution of the VUVPI-TOFMS and its present value is about $M/\Delta M = 2000$ (FWHM).

More information: Zuoying Wen et al. Online analysis of gas-phase radical reactions using vacuum ultraviolet lamp photoionization and time-of-flight mass spectrometry, *Review of Scientific Instruments* (2020).
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