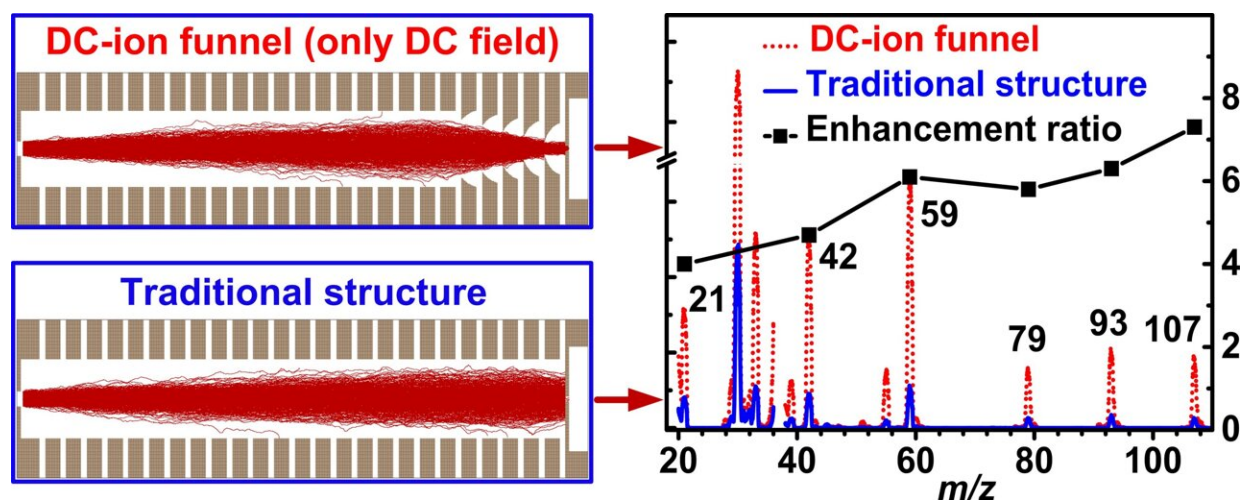


# Improving ion transmission efficiency of mass spectrometers

May 16 2022, by Zhang Nannan



Focusing effect of the DC-ion funnel. Credit: Zhang Qiangling

A recent study by researchers from the Hefei Institutes of Physical Science and published in *Analytical Chemistry* presents a novel electrostatic field ion funnel focusing technology called direct current (DC)-ion funnel. It realizes ion focusing with only a DC electric field, thus improving the sensitivity of mass spectrometers.

Proton transfer reaction mass spectrometry (PTR-MS) is a valuable tool in many fields. However, how to ensure the high sensitivity while reducing volume and power remains a difficult problem for miniaturized

mobile PTR-MS (M-PTR-MS). To improve the sensitivity of PTR-MS instruments, researchers generally use a [radio frequency](#) (rf)-focusing [electric field](#) in drift tubes to focus ions, which increases [power consumption](#) and volume and is therefore not suitable for M-PTR-MS.

In this study, the researchers replaced the traditional ring electrode with five curved electrodes and a metal mesh welded to the curved electrode. The diminishing inner diameter of the five curved electrodes they designed helps the efficient ion focusing. That's how they realized the DC-ion funnel focusing in DC electrical field.

The new structure has many advantages. Compared with traditional drift tube, the sensitivity of the DC-ion funnel tube was increased from 3.8 times to 7.3 times. In addition, the new DC ion funnel drift tube retains the soft ionization in PTR-MS.

The researchers applied this DC-ion funnel technology to the M-PTR-MS for mobile monitoring of atmospheric volatile organic compounds. And the result was impressive.

In addition, the DC-ion funnel can easily be coupled to other types of mass spectrometers to improve their detection sensitivity, which can provide key technical support for the development of frontier mass spectrometers.

**More information:** Qiangling Zhang et al, Evaluation of a New DC-Ion Funnel Drift Tube for Use in Proton Transfer Reaction Mass Spectrometry, *Analytical Chemistry* (2022). [DOI: 10.1021/acs.analchem.1c05086](#)

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