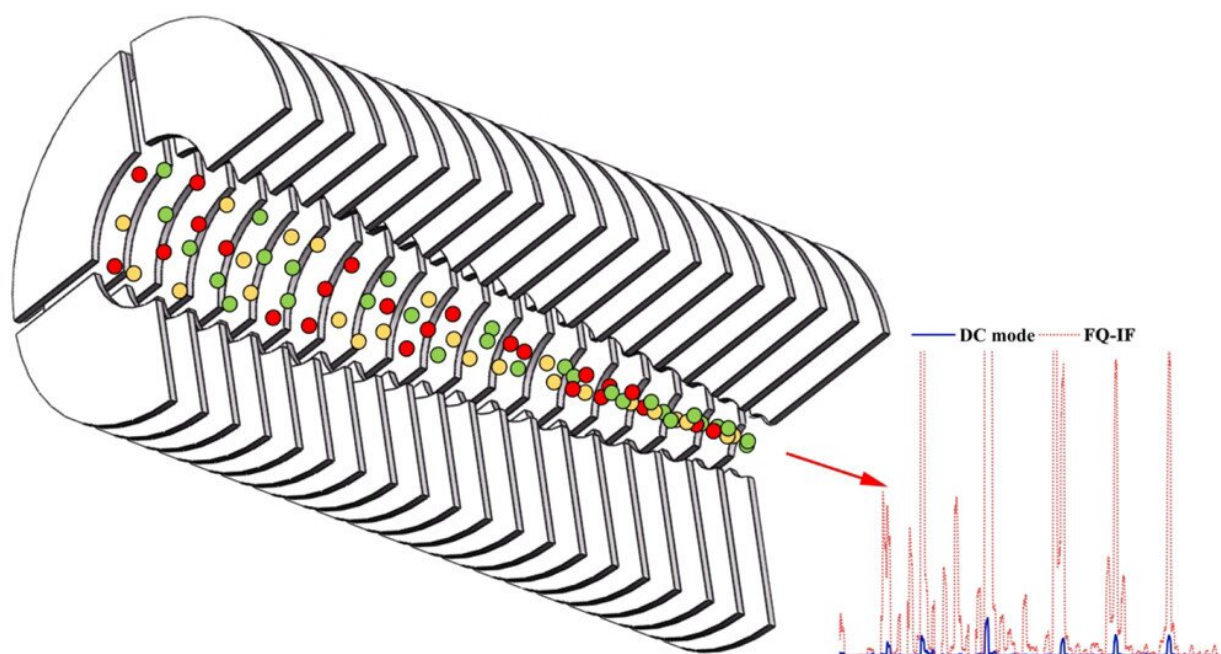


Novel focusing quadrupole ion funnel developed to improve detection sensitivity of mass spectrometers

October 10 2022, by Zhang Nannan



The focusing effect of the FQ-IF drift tube. Credit: Bao Xun

According to a recent study published in *Analytical Chemistry*, researchers from the Hefei Institutes of Physical Science (HFIPS) of the Chinese Academy of Sciences (CAS) have proposed a novel focusing quadrupole ion funnel (FQ-IF) that takes advantage of radio frequency ion focusing technology in proton transfer reaction mass spectrometry

(PTR-MS) and greatly improves its sensitivity, endowing it with a better "sense of smell."

PTR-MS is an important analysis technique for the real-time detection of volatile organic compounds (VOCs). Detection sensitivity is a critical performance in PTR-MS. The successful determination of trace VOCs lies on the sensitivity of the instrument, so sensitivity enhancement is a pursued topic in PTR-MS.

"The FQ-IF [drift](#) tube we developed could improve ion transmission efficiency," said Bao Xun, first author of the study, "and it offers a suitable collision condition."

He further explained its structure. The tube consists of 20 layers of stainless steel electrodes, each with four quarter rings. The first six layers have a constant bore diameter of 22 mm. The latter 14 layers taper the inner diameter to eight mm. The ion transmission efficiency in the drift tube is improved by the radio frequency electric field, which is the key to increase the sensitivity and provides more possibilities for PTR-MS.

The sensitivity of the FQ-IF range now was 13.8 to 87.9 times higher compared to the conventional direct current drift tube, and 1.7 to 4.8 times higher compared to the ion funnel drift tube.

The improvements in the limit of detection for the FQ-IF ranged from 2.7 to 35.7 times compared to the conventional direct current drift tube.

In addition, the FQ-IF drift tube can be easily coupled to other types of mass spectrometers to increase the [detection sensitivity](#) and may offer considerable benefits.

More information: Xun Bao et al, Increased Sensitivity in Proton

Transfer Reaction Mass Spectrometry by Using a Novel Focusing
Quadrupole Ion Funnel, *Analytical Chemistry* (2022). [DOI:
10.1021/acs.analchem.2c01893](https://doi.org/10.1021/acs.analchem.2c01893)

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