

The PTR 3c

PTR-TOF-MS

Providing fully transportable analysis.

Kore Technology designed the world's first time-of-flight mass spectrometer to couple to a proton transfer reactor back in 2002, and we have continued our innovation since. Our latest development is the PTR 3c.

The Compact PTR 3c is a new soft chemical ionisation tool for sensitive analysis of VOCs in ambient air. Using soft chemical ionisation, the time-of-flight mass spectrometer can monitor all masses in parallel, allowing the maximum amount of information to be collected. The Kore PTR 3c has been developed to be transportable and can be taken on-site (mains power required), with full computer control of instrument parameters.

PTR-MS is a soft ionisation method utilising H_3O^+ ions to transfer protons to all compounds with a higher proton affinity than water. General components in air are not ionised by the hydronium beam, but most volatile organic compounds (VOCs) are ionised by H_3O^+ with little or no fragmentation. Other molecules such as hydrogen sulphide (H_2S), hydrogen cyanide (HCN) and ammonia (NH_3) can be detectable by this H_3O^+ PTR-MS method.

Ionisation takes place in a low-pressure reactor (0.1 to 2 mBar) under dilute conditions i.e. avoiding competition for charge between different analyte molecules, as might happen with API sources. The result is very high sensitivity combined with linearity and simple quantification. The same hardware can also be used with other reagent ions if desired O_2^+ and NO^+ are common choices.

Automatic reactor pressure control

This feature uses fine, stepper motor control of a needle valve in order to maintain the reactor pressure at a constant, user-defined pressure. The pressure of the reactor is constantly monitored by a capacitance manometer and the signal can be used to feedback and maintain the reactor pressure constant.

Reagent gas metering

Whether using H_3O^+ as the reagent ion or another gas to produce a reagent ion such as O_2^+ , a solid state device measures the reagent gas flow into the glow discharge ion source, thus enabling the reagent flow to be set accurately and to be repeatable.

PTR monitor software

A new, dedicated software utility controls and displays key parameters that determine the collision energy inside the reactor. The reactor pressure and temperature are entered by the user, and these

are used for feedback control of these parameters. The resultant E/n value is calculated in real time and displayed. These key parameters are subsequently stored with the data set. The reagent gas metering flow rate is also displayed in this utility.

High mass resolution, high mass accuracy TOF spectrometer

All control voltages of the mass spectrometer are now under full computer control with read-back facilities. The instrument operates with a mass resolution of $\sim 3,000$ at full transmission (high sensitivity), but the resolution can be increased further with some transmission losses. This can be useful, for example, where obtaining data at the highest resolution reduces the uncertainty of the exact mass of an unknown peak of interest.

Silicosteel-coated analyte lines

Now, as standard, all stainless steel surfaces leading to the reactor and that are in contact with analyte gas, including the pressure-determining needle valve, are coated with an inert coating to prevent adsorption of analytes such as small, sulphur-containing molecules.

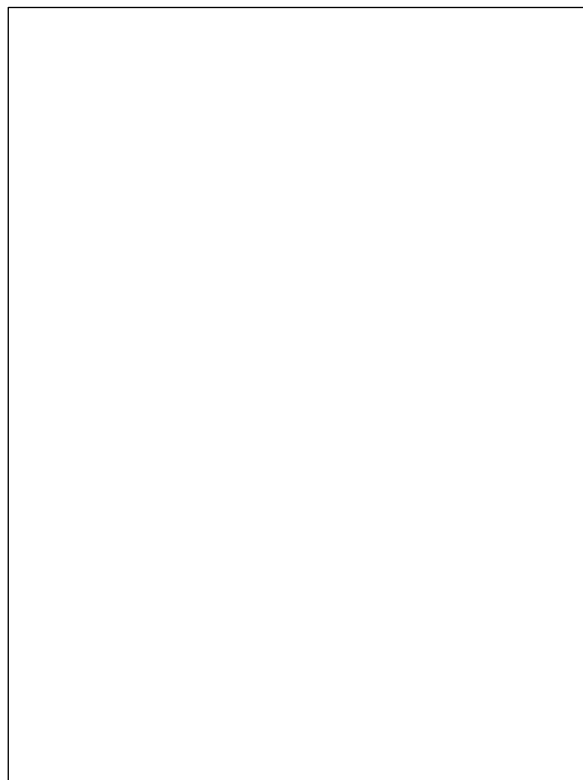
Easy-to-service analyte inlet and reactor system

In a well-used instrument, the cathode of the glow discharge ion source requires periodic cleaning. The architecture and the fittings used for the reactor oven and inlet gas lines has been completely redesigned to allow easy disconnection and, importantly, the ability to reconnect with assurance of vacuum integrity. The inlet system can now be disassembled and reassembled under vacuum within one hour.

Application Areas

- Live VOC monitoring while driving (ambient air, product quality control and testing)
- VOC analysis
- Clean room air quality monitoring
- Breath analysis
- Food analysis
- Homeland security
- Odour identification (buildings, factories etc)
- Fence line monitoring

All the Kore Technology PTR-MS models can be upgraded to increase the functionality and usability of the Kore Technology PTR-MS instruments. Our optional modules have been developed to provide a complete PTR-MS solution.



Reagent Ion Switching

This optional module allows rapid switching of reagent ion gases under full computer control (water vapour and 2 alternative reagent ion gasses). The switching can be controlled manually or set to switch at pre-set time intervals.

Permeation Calibration Device

The permeation mass calibration device is a heated module to allow addition of a low concentration of a mass calibrant through a permeation device directly into the PTR reactor allowing automatic mass calibration with a calibrant across the mass range 0-350 amu.

Heated Inlet Lines

All our PTR-MS instruments can be supplied with internal and external heated inlet lines, capable of 200°C and constructed of passivated inert materials for minimum VOC losses and low VOC adsorption.

PTR Field Measurement Kit

As part of our extensive prototype testing, we designed a field measurement kit to take some of the hassle out of field campaigns. The kit comprises of winch equipment to get a compact PTR-MS into and out of a van and power adapters and equipment for running the instrument using a custom designed portable power supply (the Kore Technology Field Battery Pack).

Inlet Flow Control

For some user applications, it is important to know the flow of sample/analyte gas past the sampling inlet, in order to reduce residence time of sample gas in the inlet system and to produce repeatable sampling conditions. This optional extra allows for computer-controlled inlet flow by mass flow controller, allowing the user to set the flow of inlet gas up to 1 LPM.

Inlet Modules

Kore Technology have developed a series of robust inlet modules including PTFE swab desorbers, trap tube desorbers and SPME desorbers.

Flight Cases

Our standard shipping containers are reusable padded wooden crates, which our customers often use for transporting the instruments to field sites. We also offer reusable flight cases with shock protection and durable sides for customers that ship the instruments regularly to field measurement sites.

PREFICS accessory:

Pre concentrator with Fast Integrated Chromatographic Separation.

The fast thermal swab desorber that is one of three sample inlet systems that we have developed for PREFICS is also available as a separate interface for our PTR-TOF-MS instruments for sensitive detection of semi-volatiles.

The PTR 2e

PTR-TOF-MS

Providing high-performance analysis.

The Kore PTR 2e: PTR-TOF-MS

Kore Technology designed the world's first time-of-flight mass spectrometer to couple to a proton transfer reactor back in 2002, and we have continued our innovation since. We are pleased to present our larger, higher performance PTR-TOF-MS instrument, the PTR 2e.

Kore's original PTR instrument has been re-designed to deliver:

- High sensitivity resulting in low detection limits for analyte species
- High mass resolution for unambiguous identification of chemical species
- A rugged, transportable instrument for use in field work

PTR-MS is a soft ionisation method utilising H_3O^+ ions to transfer protons to all compounds with a higher proton affinity than water. General components in air are not ionised by the hydronium beam, but most volatile organic compounds (VOCs) are ionised by H_3O^+ with little or no fragmentation. Other molecules such as hydrogen sulphide (H_2S), hydrogen cyanide (HCN) and ammonia (NH_3) can be detectable by this H_3O^+ PTR-MS method.

Ionisation takes place in a low pressure reactor (0.1 to 2mbar) under dilute conditions i.e. avoiding competition for charge between different analyte molecules, as might happen with API sources. The result is very high sensitivity combined with linearity and simple quantification. The same hardware can also be used with other reagent ions if desired O_2^+ and NO^+ are common choices.

High Sensitivity

The Series 2e Kore PTR-MS features a new and novel PTR reactor with a Kore-designed ion concentrator as part of the reactor, capable of achieving > 200 cps/ppbv Benzene. This greatly reduces the ion losses that would normally occur in the reactor owing to a phenomenon known as 'space charge', in which high-density ions repel each other. This novel device channels the ions to the exit of the reactor, resulting in a high current ion beam passing into the next part of the instrument. This reactor and concentrator could also be fitted to the [Series 1 PTR-TOF-MS](#).

High Mass Resolution

The Series 2e PTR-MS from Kore features a new spectrometer capable of delivering up to 8,000 mass resolution. For routine operation, the instrument operates at >5,000. The flight path is longer than the series I instrument, resulting in a lower repetition rate (pulse frequency), and this reduces the sensitivity somewhat from the smaller instrument, but with the added advantage of high mass resolution. Nevertheless, sensitivity levels are still high even at high mass resolution with Benzene >

200 cps/ppbv.

Rugged and Transportable

The Series 2e PTR-MS instrument is designed for easy and safe transportation and yet with sufficient mass resolution and sensitivity to satisfy the most demanding applications. It is housed in a purpose-designed vertical rack to permit easy transportation in a standard van. The instrument is 'floated' inside the frame so that it is 'cushioned' during transportation.

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