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Method and Device for Transferring Ions for Mass Spectrometry Analysis

New devices and methods dramatically improve the efficiency of ion transfer to mass spectrometers from distant samples by utilizing enlarged flow and specialized high-flow, low-compression pumps.

When using a mass spectrometer (MS) with an atmospheric pressure interface for chemical analysis, the ions are usually generated in the vicinity of the mass spectrometer inlet (on the order of 2 cm). The opening of the MS inlet is typically smaller than 700 m, due to the fact that a vacuum needs to be maintained inside a manifold where ions are mass analyzed. In applications where the ions need to be generated far from the mass inlet, efficient ion transfer is required. Previously, the MS inlet tubing was extended up to 3 m to achieve a non-proximate detection of the chemical desorbed from surfaces as ions. The pumping by the mass spectrometer pumps, mainly the rotary vane pumps, was used to create the flow inside the tubing to transfer the ions into the mass spectrometer. Significant fractions of the ion current are lost, presumably due to collisions with the inside wall of the tubing and neutral gas phase molecules.

Purdue University researchers have developed devices and methods that provide enlarged flow to carry the ions from a distant sample to close to the MS inlet. The large flow conductance of the tube allow the gas carrying ions to move toward the MS inlet at a fast flow rate. Pumps with high flow rates, but low compression ratios, are used to generate the flow inside the tube. The proper pumps used for the coupling are different from those used for the mass spectrometer, which are typically of high compression ratio.

Advantages:

-Enlarged flow

-Increased conductance

Potential Applications:

-Mass Spectrometry

Technology ID

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Category

Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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Intellectual Property:

Provisional-Patent, 2008-10-13, United States | DIV-Patent, 2009-10-05, European Patent | NATL-Patent, 2009-10-05, China | NATL-Patent, 2009-10-05, Japan | NATL-Patent, 2009-10-05, European Patent | PCT-Patent, 2009-10-05, WO | NATL-Patent, 2011-04-05, United States | CON-Patent, 2012-12-27, United States | CON-Patent, 2013-07-09, United States | CON-Patent, 2014-02-14, United States | CON-Patent, 2014-08-08, United States | CON-Patent, 2015-01-12, United States | CON-Patent, 2015-10-12, United States | CON-Patent, 2016-11-01, United States | CON-Patent, 2018-05-24, United States

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