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Ion Generation by Electrospray using Wetted Porous Material

A new paper-based method simplifies and enhances mass spectrometer analysis by combining sample preparation and ionization, improving efficiency for complex and biological samples.

Electrospray ionization is regarded as the best characterized and most efficient method for ionization of molecules in solution phase. There are three main stages in the process: droplet formation, droplet evaporation, and ion formation. When a strong electric field is applied, a cone forms and a mist of small droplets is emitted from the tip. This method can produce small, charged droplets under a low flow rate; however, the small size of the tip and the materials used cause problems with the source, which results in the tip easily becoming damaged or clogged. Other methods for overcoming clogging have been developed, but these methods still only work for pure chemicals dissolved in solution.

Purdue University researchers have developed a method that can combine the sample pretreatment and ionization process to reduce the complexity of the device and make it more efficient. This paper method has many benefits that will address the problem of sample introduction in mass analyzers and accelerate the application of miniature spectrometers in situ analysis.

Advantages:

-Few other things required for in situ analysis

-Biological samples can be stored in the precut filter papers for months

-Filter paper minimizes matrix effects and enhances the MS signal of chemicals in complex samples

-Powdered samples can be directly applied to the paper and then analyzed without requiring pretreatment

-Paper can be pretreated to contain internal standards that are released at certain points in quantitative analysis

Technology ID

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Category

Materials Science & Nanotechnology/Materials Testing & Characterization Tools

Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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Potential Applications:

-Chemical Analysis

TRL: 8

Intellectual Property:

Provisional-Patent, 2009-04-30, United States | Provisional-Patent, 2010-02-26, United States | EP-Patent, 2010-04-29, Germany | EP-Patent, 2010-04-29, France | DIV-Patent, 2010-04-29, Japan | DIV-Patent, 2010-04-29, Singapore | EP-Patent, 2010-04-29, United Kingdom | NATL-Patent, 2010-04-29, Australia | NATL-Patent, 2010-04-29, Singapore | PCT-Patent, 2010-04-29, WO | NATL-Patent, 2010-04-29, China | NATL-Patent, 2010-04-29, New Zealand | NATL-Patent, 2010-04-29, Japan | NATL-Patent, 2010-04-29, European Patent | NATL-Patent, 2010-04-29, Canada | NATL-Patent, 2010-04-29, India | NATL-Patent, 2010-04-29, Republic of Korea | Utility Patent, 2012-01-31, United States | CON-Patent, 2012-12-26, United States | CIP-Patent, 2013-03-04, United States | CON-Patent, 2013-09-11, United States | CON-Patent, 2013-09-12, United States | Trad

Keywords: Electrospray ionization, ESI, mass analyzer, miniature spectrometer, in situ analysis, paper-based ionization, sample pretreatment, biological sample analysis, matrix effects minimization, chemical analysis, Chemical Engineering, Chemistry and Chemical Analysis, Mass Spectrometry