ON-LINE AND OFF-LINE COUPLING OF ELECTROCHEMISTRY (EC) WITH MASS SPECTROMETRY BY LIQUID SAMPLE DESI

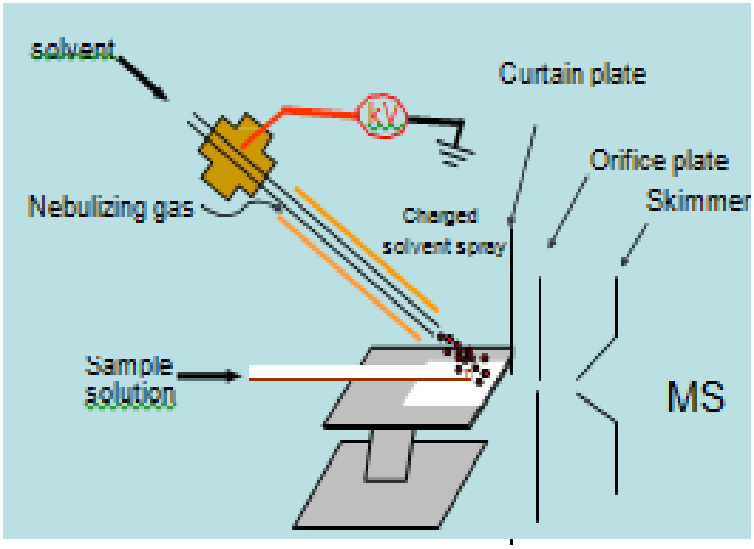
OU ID: #09030

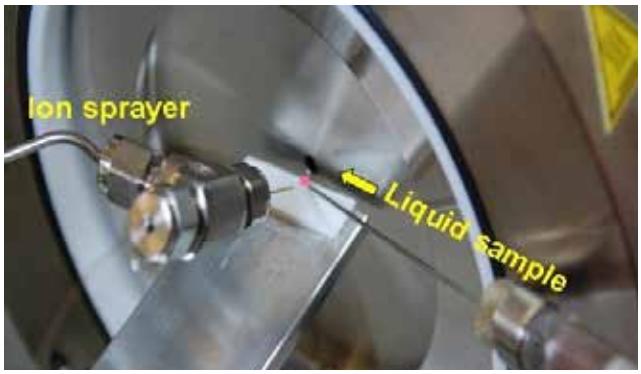
Overview

A variety of ambient ionization methods have been introduced, including desorption electrospray ionization (DESI). DESI is a representative method for ambient mass spectrometry. It has been shown to be useful in providing a rapid and efficient means of desorbing and ionizing a variety of target compounds of interest under ambient conditions. In U.S. application Ser. No. 12/205,236 DESI has been shown to analyze liquid samples without the use of filters. Still, it would be beneficial to use the liquid sample DESI-MS technique in combination with electrochemistry (EC) to allow both mechanistic study of reduction-oxidation (redox) and electrolysis reactions, particularly for bioanalytical applications. Liquid sample undergoing electrolysis in a chemical cell can be online or offline ionized by liqui sample DESI for MS detection.

Commercial Application

The technology can have several beneficial applications in areas of chemical analysis that require a high degree of selectivity. DESI has been highly successful in analyzing a series of samples that may include pharmaceuticals, metabolites, drugs of abuse, explosives, chemical warfare agents and intact tissues. Coupling the DESI technology with electrochemical cells provides even more possibilities for this field, mimicking metabolism. It provides direct analysis of the redox products, or intermediates, of an electrochemical reaction.





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Benefits

- There is no need for decoupling or floating the electrochemical cell from high voltage.
- There is no dead connection volume between the tubular cell and DESI ionization source, which is beneficial for detecting short-life transient species formed from electrochemistry.
- High salt tolerance of DESI over ESI will allow the more choices in selecting electrolytes for electrochemical oxidation/reduction than that in previously coupling using ESI.
- The integration of ion/molecule or ion/ion reactions in such an EC/DESI-MS apparatus will enable online derivatization without causing the analyte itself being electrochemically damaged.
- The offline experiment shows the potential of using this method in the analysis of small volume of samples and for high throughput anlysis.

Inventor

Hao Chen, Ph.D. received his doctoral degree in Chemistry from Purdue University in 2005. He is an associate professor in chemistry at Ohio University. Dr. Chen performs research on organic and biological mass spectrometry for bioanalysis and instrument development. He has received over $800,000 in research funding and has published over 60 journal papers.

Development

Further work includes the miniaturization of both DESI and EC cells

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