Chemically Resolved Microscopy Using Microplasma Discharges

A microplasma device that serves as an ion source for a mass spectrometer

Georgia Tech inventors have developed a microplasma device that serves as an ion source for a mass spectrometer. The microplasma device is used for desorption and ionization of a sample by partially ionizing a gas to form a plasma and then directed on the surface of a sample to desorb molecules. Molecules are ionized by the plasma effluent stream as they leave the surface of the sample can be directed to a mass spectrometer for analysis. The ionized gas can be any pure or mixture of gases including air, argon, helium, or neon. The addition of hydrogen produces high energy vacuum ultraviolet protons that can aid in the desorption/ionization process. This technology is able to work under ambient conditions and is primarily a non-thermal process which minimizes or eliminates damage to the sample. This technology has the ability to analyze a broad range of samples, including skin/cell cultures, liquid samples, or other solid surfaces at a higher resolution than currently exists.

Summary Bullets

- Can be operated under ambient temperature and pressure
- Higher chemical and spatial resolution than currently exists
- Has the ability to pair mass spectrometry to microscopy

Solution Advantages

- Can be operated under ambient temperature and pressure
- Higher chemical and spatial resolution than currently exists
- Has the ability to pair mass spectrometry to microscopy
- Can ionize a wide variety of surfaces

Potential Commercial Applications

- Commercial spectroscopy
- Chemically mapping on any surface
- Surface analysis
- Proteomics
- Metabolics

- Glycomics
- Cancer research
- Drug discovery
- Immune response

Background and More Information

Mass spectroscopy is a technique that is used to understand the chemical composition of a sample or compound by analyzing its mass to charge ratio. A sample must be ionized into charged particles and then passed into a mass spectrometer to analyze. Most mass spectrometry devices use electron, ion, and laser beam ion sources, however these approaches can only operate under high vacuum conditions and are not effective under ambient temperature and pressure. Some ionization approaches, such as desorption electrospray ionization (DESI) and plasma torches (PADI), have been used to determine chemical compositions under ambient conditions, but are limited to the mm scale. Therefore, there is a need for a new ion source that can operate under ambient temperature and pressure and can analyze samples at a higher spatial resolution.

Inventors

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Publications

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Images

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