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Recent Patent Describes a New Method to Separate and Characterize Ions

Scientists' approach employs time-dependent electric field with novel waveform profiles

With resources at the Department of Energy's EMSL, researchers from the Pacific Northwest National Laboratory devised a fundamentally new approach to identify ions in gases and separate their mixtures, termed High-Order Differential Ion Mobility Spectrometry (HOD IMS). The method provides new avenues for more complete separation of complex samples and more specific characterization of their components, with envisioned applications in proteomics, metabolomics, and environmental analyses. By reducing or eliminating the need for chromatographic or other liquid-phase separations before mass-spectrometry, the new approach may accelerate analyses by an order of magnitude.

Alexandre Shvartsburg

Gordon Anderson

HOD IMS is a new ion mobility paradigm where ions are filtered based not on the absolute mobility, but on higher derivatives with respect to the electric field intensity. This is achieved using a periodic, time-dependent field comprising three or more harmonics. The new methodology was patented in November 2008. A U.S. patent was awarded to Alexandre Shvartsburg, Richard D. Smith, and Gordon Anderson.

Richard D. Smith

Scientific impact: The methodology described in the patent would improve and speed the analysis of gas-phase ions, alone and in conjunction with known methods of mass spectrometry, chromatography, and ion mobility spectrometry. This work is part of EMSL's ongoing efforts to predict biological functions from molecular and chemical data.

Societal impact: Separating and characterizing ions is vital to numerous research areas, including the detection of biomarkers of cancer and other diseases, determination of the health risks of low-level radiation exposure, understanding natural bioremediation processes to enable their control, and detection of explosives and chemical warfare agents.

For more information, contact EMSL Communications Manager Mary Ann Showalter (509-371-6017).

Reference: Shvartsburg AA, RD Smith, and GA Anderson. "Method and Apparatus for High-Order Differential Mobility Separations." U.S. Patent 7,449,683 (2008).

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