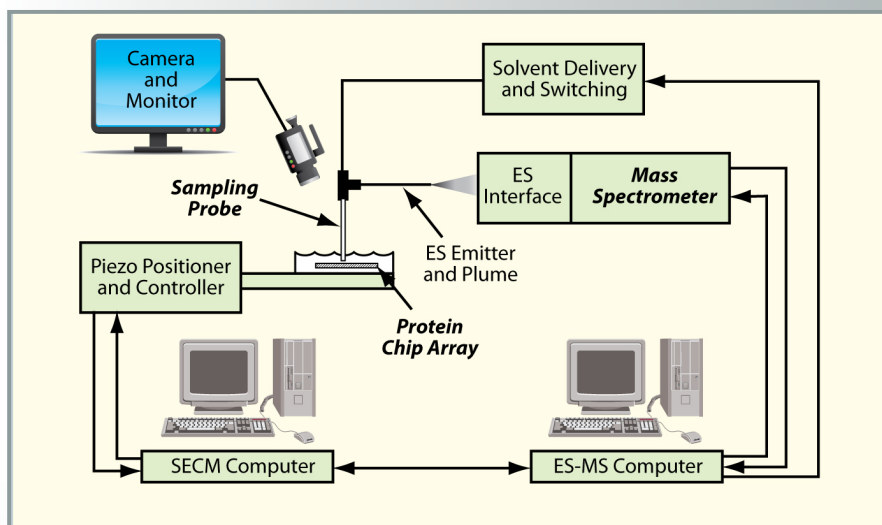


Automated Sampling for Microarray Readout Using Electrospray Mass Spectrometry

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Technology Summary

The growth of the microarray market has been limited by detection methods requiring complicated and unreliable external labeling. A new sampling and analysis technique that quickly determines the elemental composition of a microscopic sample was invented at ORNL. This sensitive, molecule-specific detection method offers a rapid and reliable solution that can sample virtually any surface.

The automated sampling system moves over a microscopic surface, where proteins and chemicals are arranged in self-assembling arrays, and directs a probe that takes continuous samples. Samples are then transferred for analysis by mass spectroscopy. When this approach is applied to sampling protein microarrays, it is possible for the first time to rapidly identify complex protein interactions, protein substrates, and any other components, such as candidates in the drug discovery process.

The invention uses a probe with flowing fluid to form a "liquid bridge" to the sample surface. The probe applies a solvent to the sample that removes molecules adsorbed to the surface and directs them up the probe. The analyte materials can be intact proteins, protein fragments, pharmaceutical agents, or antibodies. An electrospray ion source then ionizes the sample and breaks it into fragments. These fragments are analyzed by mass spectroscopy, while the probe continues moving over the surface, repeating the sampling process. A scanning probe electrochemical microscope moves the probe over the surface, providing positional control with a minimum one nanometer resolution.

Advantages

- Rapid identification of microarray components
- Accurate sample identification
- Continuous sampling process
- Able to sample virtually any surface

Potential Applications

- Protein microarrays, protein expression profiling, protein interaction profiling
- Drug discovery
- Antibodies, receptors, ligands
- Nucleic acids (DNA)
- Carbohydrates, gels (isoelectric focusing gels)
- Chromatographic surfaces: cationic, anionic, hydrophobic, hydrophilic
- Other molecularly imprinted materials

Patent

Gary J. Van Berkel, *Sampling Probe for Microarray Read Out Using Electrospray Mass Spectrometry*, U.S. Patent 6,803,566 B2, issued October 12, 2004.

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