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Licensable Technologies

Desorption/Ionization Mass Spectrometry from Mesoporous Silica

Applications:

- Research and study of small molecules
- Proteomics
- Drug development and pharmaceuticals

Benefits:

- Eliminates matrix molecule interference in MALDI analysis
- Improves quality of analysis
- Enables study of surface chemistries
- Potentially increases sample throughput
- Provides universal method of study for wide range of samples
- Uses simple, inexpensive sample preparations
- Provides increased substrate stability
- Ionizes compounds with broad molecule weight

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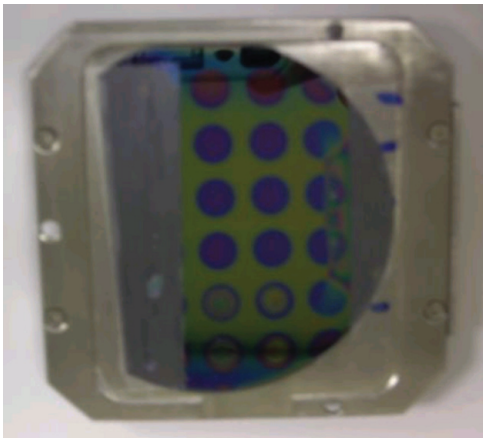
Summary:

Matrix assisted laser desorption/ionization mass spectrometry, or MALDI-MS, has become one of the most used techniques for analyzing compounds, including potential drugs and proteins. Los Alamos National Laboratory (LANL) has developed a technology that will improve the current state-of-the-art by allowing MALDI-MS to be performed on a nano-composite film with no matrix additives.



Digital photograph of a prototype film mounted on a stainless steel Maldi probe

In traditional MALDI-MS assays, compounds of interest are embedded in a matrix for analysis. However, with this technique, matrix interference is a complication, especially for small molecules (<1000 Da). In addition matrix conditions required for ionization of the target molecule are highly specific, and lengthy experimentation is required to optimize the assay. In response to these complications, some researchers have started using a thin-film like porous silicon as a substrate. However, this has limited success as the porous silicon substrates have limited useful lifetimes of about one month and require special handling.

The ordered nano-composite film developed by LANL scientists eliminates the complications associated with both MALDI-MS and matrix-free desorption/ionization mass spectrometry (DIMS). The nano-composite matrix eliminates any interfering signals from matrix molecules. This greatly improves the quality of the analysis and enables the study of surface chemistries such as targeted breakdown of the sample molecules on the chip. Additionally, the nano-composite substrate can be readily prepared by simple, inexpensive techniques and offers increased stability. The nano-composite is also capable of ionizing compounds with a broad range of molecular weights.

The nano-composite developed is a mesoporous silica thin film that offers the desired stability and acts as an excellent substrate for DIMS. The films are patterned to spot many analytes, either aqueous or non-aqueous, on a single substrate. Development is ongoing to increase the types of molecules that can be studied by the DIMS technology using the nano-composite substrate. This technology will include analysis of proteins and potential drug molecules, peptides and nucleic acids.

Development Stage:

Proof-of-concept experiments have been conducted, and a patent application has been filed. Experimentation to explore specific applications and develop compliance with commercially available analysis software is ongoing.

Patent Status: Patent pending

Licensing Status:

The Laboratory is interested in licensing this technology on a non-exclusive basis.

www.lanl.gov/partnerships/license/technologies/