Analytical Instrumentation, Methods & Materials

Robust Substrates Expand the Utility of Surface Plasmon Resonance Imaging for Analysis of Biomolecular Interactions

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Inventors: Lloyd Smith, Matthew Lockett, Michael Shortreed, Robert Corn, Stephen Weibel, Bin Sun, Robert Hamers

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing versatile, robust substrates for use in SPR.

Overview

Surface plasmon resonance (SPR) imaging has demonstrated its ability to monitor interactions between biological moieties in real time without the aid of chemical labels such as fluorophores and radioisotopes. In SPR, a metal thin film is modified with biomolecules. When the surface is exposed to agents that may be capable of binding the biomolecules, any binding that occurs produces an easily detectable and quantifiable change to the reflectivity of the surface.

Currently, gold thin films are preferred substrates for SPR because most other metals are subject to reactions such as oxidation upon exposure to aqueous solutions and because the chemistry for attaching molecules to gold surfaces is well-characterized. However, the gold surfaces used in SPR are fragile. Additionally, the chemical bonds used to attach biomolecules to gold thin films are susceptible to damage from the UV irradiation often used in photochemical processes and are not stable under many moderate to harsh conditions, limiting the use of gold substrates. A chemically robust substrate that is usable in SPR is needed for label-free detection methods for genomics, proteomics, drug discovery and more.

The Invention

UW–Madison researchers have developed robust, SPR-compatible substrates. The key to these substrates is a rugged, chemically versatile carbon thin film overlayer placed on an SPR-active metal thin film.

Specifically, the substrates include a support surface capable of transmitting light, a metallic layer adhered to the support surface and a carbonaceous layer deposited on the metallic layer. The substrates also may include biomolecules attached to the carbonaceous, or carbon-rich, layer. These biomolecules may include oligonucleotides, DNA, RNA, proteins, amino acids, peptides or other small biomolecules that can be configured in one or more arrays.

The new substrates are more robust than conventional gold substrates, allowing assays to be performed under higher temperatures and harsher chemical conditions than currently is possible. Additionally, the carbon thin film overlayer is not susceptible to damage from UV irradiation.

Applications

- Surface plasmon resonance imaging for additional types of analyses of biomolecular interactions

Key Benefits

- Provides SPR substrates that are stable in harsh chemical conditions and not susceptible to damage from UV irradiation
- Enables the integration of SPR detection with photolithographically fabricated DNA arrays
- Provides substrates compatible with mass spectrometry analysis
- Suitable for high density microarray fabrication and analysis
- Metals other than gold may be used to increase SPR detection sensitivity.

Additional Information

For More Information About the Inventors

- Lloyd Smith
- Robert Hamers

Tech Fields

- Analytical Instrumentation, Methods & Materials : Optics
- Research Tools : Detection

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854