Materials & Chemicals

Plasma-Enhanced Functionalization of Inorganic Oxide Surfaces

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an efficient, two-step technique for functionalizing surfaces so they can bind biomolecules.

Overview

Bioactive surfaces created by binding biomolecules to the surface of inorganic substrates are used in many bioassays, biosensors, and other devices. One common approach to functionalizing surfaces so they can bind biomolecules is to use wet chemical techniques; however, these methods are time-consuming, multi-step processes involving the use of expensive and hazardous reagents.

The Invention

UW-Madison researchers have developed an efficient, two-step technique for covalently attaching epoxide functionalities to glass, silicon, quartz, and other inorganic surfaces. First, an oxide surface is exposed to a cold plasma to create hydroxyl functionalities on the surface. Next, these hydroxyl groups are reacted with epoxy group-containing molecules in the absence of plasma to form surface-bound spacer chains. Biomolecules can then be immobilized on the resulting functionalized surface by reacting the biomolecules with the spacer chains.

Applications

- Functionalizing a variety of oxide surfaces, including glass, quartz, silica and metal oxides
- Surfaces then can be used in a variety of applications, including biochips and biosensors, such as flexible, thin-film biosensors that may be integrated into traditional microelectronics

Key Benefits

- Simple and easy
- Can be performed at atmospheric pressure
- Faster than wet chemistry methods – method takes 20-30 minutes versus 24-72 hours
- Safer than wet chemistry techniques – few chemicals to use and dispose of
- Less costly than wet chemistry methods
- Requires only small quantities of starting materials
- Surfaces exhibit less non-specific binding than those created with wet chemistry techniques
- Results in higher density of bound biomolecules than conventional wet chemistry techniques
- Biomolecules bound to substrates through spacer chains exhibit freedom of movement and conformation comparable to those of free biomolecules, resulting in greater activity than biomolecules bound directly to a substrate

Additional Information

For More Information About the Inventors

- Max Lagally

Tech Fields

- Materials & Chemicals : Other materials & chemicals
- Research Tools : Arrays

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846