Washington University in St. Louis
Office of Technology Management

PRECISE, DYNAMIC CONTROL OF MACROMOLECULE ADHESION TO GLASS SLIDES AND OTHER SURFACES

Bridgman, Paul, Turney, Steve

Gill, John

T-005874

Technology Description

This technology is a patented method for producing microarrays or directing cell growth on a surface by precisely and dynamically manipulating the adhesion of macromolecules. While many techniques exist for adhering proteins, nucleic acids, and other macromolecules to solid substrates, this method is the first of its kind to enable the precise removal of surface adherents. Because this approach uses multiphoton infrared laser light to gently disrupt the binding of materials in a targeted location, the structure of the surface is preserved. New macromolecules can then be adhered in the ensuing voids to create high resolution micropatterns. This method provides a powerful tool for constructing complex or highly customized microarrays and for controlling the distribution and growth of cells on a solid surface.

Proof of Principle – The inventors have used this method to create defined neural circuits with a mixture of neuronal cells. This allowed them to distinguish between presynaptic and postsynaptic effects of a genetic mutation (see publication).

Applications

Microarray manufacture and customization- precisely and dynamically manipulate the adhesion of proteins, nucleic acids, and other macromolecules to a solid substrate

Cell culture- can detach or even guide the growth of neurons and other cells cultured on a surface by creating and modifying extracellular protein micropatterns

Key Advantages

Rapid, precise desorption of macromolecules- guided by a microscope, can quickly create high resolution micropatterns by removing surface adherents from a target area

Reversible and dynamic- gentle removal of macromolecules preserves both the adherents and the surfaces, creating space for new materials to be attached

Compatible with living cells- can remove extracellular proteins that anchor cells to a surface without damaging the attached cells

Publications

Turney, S. G., Chandrasekar, I., Ahmed, M., Rioux, R. M., Whitesides, G. M., & Bridgman, P. C. (2020). VARIATION AND SELECTION IN AXON NAVIGATION THROUGH MICROTUBULE-DEPENDENT STEPWISE GROWTH CONE ADVANCE. *bioRxiv*.

Chandrasekar, I. et al. Myosin II Regulates Activity Dependent Compensatory Endocytosis at Central

Synapses. *J. Neurosci*. 33 (41) 16131-16145 (2019).

Patents

Method for generating microscopic patterns of protein and other macromolecules (US Pat. No. 8,921,283 B2 and US Pat. No. 9,939,424 B2)

Related Web Links

Paul Bridgman website