TECHNOLOGY

Feedback Control of Particles in Microfluidic Devices

OVERVIEW

Microfluidic devices process microscopic particles and molecules suspended in exceedingly small quantities of fluid. That fluid flows very quickly through the microscopic channels located within the microfluidic device. Because the amount of fluid is so small, fluid flow is a complex process presenting exceptional control challenges to the effective viewing and manipulating of the suspended objects contained in the fluid. The analytical tools currently used to view and manipulate those objects have significant drawbacks.

Optical tweezers are limited in the types of objects that they can manipulate and they cannot control fluid flow. Electrophoresis is not operative on objects immovable by an electric field, such as objects made of a dielectric material. Coulter sorters and integrated microfabricated cell sorters do not allow for simultaneous arbitrary control over the trajectories of multiple objects. While a universal planar manipulator can control the motion of multiple objects, it cannot be applied to microfluidic devices because of the unique fluid flow properties attributed to very small amounts of fluids.

Researchers at the University of Maryland have successfully developed patented analytical technology which provides for nanometer precision, non-invasive, three-dimensional feedback control of objects either by electroosmotic manipulation on uncharged particles or by electrophoretic force on charged particles. This technology demonstrates the parallel control of multiple objects suspended or immersed in fluid such that each object follows an arbitrary trajectory without using lasers and optical traps, effectively replacing other more expensive analytical techniques.

Applications
* An integrated lab-on-a-microscope which includes a microfluidic device, an optical observation system, and a computer connected to a feedback loop;
* Streamlined pharmaceutical research and development;
* Improved clinical diagnostics;
* Enhanced drug delivery systems;
* Better bioweapons sensors.

Advantages
* Inexpensive, can be an add-on to an existing microscope;
* Computer software available for licensing;
* Nanometer precision similar to that of a near-field scanning optical microscope (NSOM) without the cost.

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Additional Information

INSTITUTION

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PATENT STATUS

US Patents 7,651,598 and 8,110,083

LICENSE STATUS

Contact OTC for licensing information

CATEGORIES

- Microfluidics

EXTERNAL RESOURCES

- US Patent 7,651,598
- US Patent 8,110,083

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