Licensable Technologies

Acoustic Method for High Throughput Analysis and Particle Sorting

Applications:

- High-throughput analysis and particle sorting
- Detection and identification of cellular binding events
- Sorting of chiral molecules
- Sample purification
- Separation of carbon nanotubes based on wall thickness and length

Benefits:

- May be used to sort delicate cells without destruction
- Increased speed and efficiency of sorting with multi-size particles
- Allows use of lower power, lower cost counting lasers
- Technique may be applied to existing instruments

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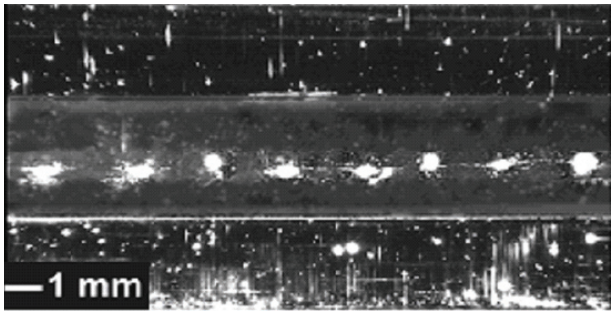
Summary:

For biomedical researchers, the ability to sort particles in a sample is a critical need with constantly expanding application areas, including cellular profiling, pharmaceutical manufacturing, and selection of rare multicellular events. To date, high-speed cell sorting has been done using charge-based droplet sorting coupled with multiparameter optical analysis of particles in a flow cytometer. However, this method is rate-limited due to the random delivery of particles to the flow cell and requires the use of highly stabilized lasers for optical analysis.



Ten micrometer diameter polystyrene particles radially focused and regularly spaced along the axis of quartz capillary using acoustic forces.

To address these problems, scientists at Los Alamos National Laboratory (LANL) have developed an acoustic technique that enables higher sorting rates and offers cost savings compared with current techniques. This technique uses acoustic standing waves to deliver concentrated particles in a controlled, well-spaced array along the axis of the flow cell. Because the particles arrive at the count site at a predetermined time rather than at random intervals, counter efficiency and speed are vastly improved. Particles can also be separated by acoustic properties, such as size, and carefully timed to arrive at the counter, allowing near simultaneous multi-channel counting, that is, counting of multiple types of particles from a single sample introduction. This arrangement avoids the common count-slowing problem of "empty droplets" by ensuring that particles are in known positions in the flow stream. Within a single flow line, count rates are up to five times higher than current methods. Additionally, the system is well suited to parallel flow lines to boost counting rates even higher.

The acoustic source also creates a long residence time for the particles within the acoustic positioning field, allowing the use of low pressure to drive the acoustic focusing field. This prevents damage to fragile biological particles, such as red blood cells or leukocytes, and lowers the power required to run the instrument. The long transit times and predictable delivery of particles at the count site also eliminate the need for expensive, highly stabilized lasers, greatly reducing the overall instrument cost.

LANL's proprietary acoustic particle delivery system offers significant advantages over currently used techniques, and may be applied to existing instruments.

Development Stage:

Proof of concept; empirical testing ongoing

Patent Status:

Patent pending

Licensing Status:

This technology is available for licensing.

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