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Multisite Particle Concentration with Integrated Microlenses and Related Methods

This inexpensive, self-contained lab-on-a-chip platform uses an array of microsized lenses and plasmonic components to greatly enhance particle sensing and sorting throughput, even in low-analyte-concentration media.

Current state of the art technologies used in micro- and nanoscale lenses for sorting and sensing concentrations of particles are unable to perform multisite sorting and sensing on a self-contained lab-on-a-chip platform. This severely limits throughput potential and sensing speeds. In addition, current technologies cannot sense well in a media with low analyte concentration due to diffusion-limited transport of target analytes and their limited number of sensing sites.

Researchers at Purdue University have developed an array of microsized lenses that are used to focus light from an unfocussed source onto multiple focused spots. These focused spots contain plasmonic components made of arrays of plasmonic nanostructures. The light incident on the plasmonic components induces hydrodynamic flows, resulting in the rapid transport of suspended particles, bringing them to the surface of the components where they are captured. The self-contained lab-on-a-chip platform enhances the throughput performance, and the ability to utilize hundreds to thousands of trapping sites allows this platform to greatly outperform current technologies in the sensing of particles in media with low analyte concentrations. Existing solutions are also very expensive, whereas this technology can utilize multifunctional, inexpensive light sources to outperform the more expensive alternatives.

Advantages:

-Less costly

-Enhanced throughput performance

-Utilizes hundreds to thousands of trapping sites

Technology ID

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Category

GreenTech/Water & Resource Management
Materials Science & Nanotechnology/Nanomaterials & Nanostructures
Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

Authors

Alexandra Boltasseva
Alexander Kildishev
Justus C Ndukaife
Agbai (George) Nnanna

Further information

Will Buchanan
wdbuchanan@prf.org

View online

Potential Applications:

-Detection of contaminants in biological samples

-Testing quality of drinking water or cleaning solutions

-Testing cleanliness of power generation equipment, manufacturing parts, or injectable drugs

-Determine cleanliness level of hydraulic fluids

TRL: 4

Intellectual Property:

Provisional-Patent, 2015-06-04, United States | Utility Patent, 2016-06-06, United States

Keywords: microsized lenses, plasmonic components, nanostructures, hydrodynamic flows, lab-on-a-chip, particle sensing, low analyte concentration, enhanced throughput, multisite sorting, inexpensive light sources