Label-Free Method of Measuring the Interactions of Non-Tethered Particles

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Technology description

The invention uses a novel method involving near-field optical trapping to detect and measure the interactions of untethered particles ranging in size from 10nm to 20µm. The particles can be non-biological or biological, including cells.
The current invention allows for label-free analysis of free-solution molecular interactions with increased resolution for particles ranging in size from 10 nm to 20µm. The method involves the use of a near-field optical trap and exploits the fact that the optical force exerted on a trapped particle is proportional to the particle’ s volume and polarizability. Moreover, the spring constant or the trap stiffness can be extracted from the Brownian fluctuation of the trapped particle. By observing these fluctuations, the interaction of molecules, such as binding, to the trapped particle can be detected and measured.
As proof of principle, this label-free method was used to determine the number of specific antibodies that bound to an optically trapped H1N1 influenza virus – 26 ± 4 (6.8 ± 1.1 attogram) anti-influenza antibodies bound to one H1N1 influenza virus.
Pilgyu Kang, & al. (2015). Nanophotonic detection of freely interacting molecules on a single influenza virus. Scientific Reports 5, Article number: 12087. doi: 10.1038/srep12087 .

Application area

Measuring particle interactions in real time
Screening and developing drug compounds
Identification of pathogens
Studying the potential pathogenicity and virulence of rapidly mutating viruses.

Advantages

Label-free analysis of free-solution molecular interactions
No need for spectroscopic methods that require expensive cameras and power management equipment
Range in particle size of 10 nm to 20 um; competing technologies are limited to aperture size of trapping holes

Institution

Cornell University

Inventors

David Erickson
Pilgyu Kang