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DETECTING AND MEASURING SINGLE NANOPARTICLES & MOLECULES WITH A TAPERED OPTICAL FIBER CIP

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The invention describes an instrument for detecting single particles, and measuring their properties (size or mass). The device contains only a tapered optical fiber. A laser diode as the light source and a photo-detector to measure the light intensity are also needed to complete the sensing system. The tapered fiber is fabricated by heating and pulling a single mode optical fiber. The waist of the taper is below 1 micron. The resulting narrow diameter concentrates the light in the fiber taper and enhances the interaction of light with the objects attached to or passing by the surface of the taper. The discrete changes in the transmission and reflection light intensity in the fiber indicate the detection of a nanoparticle or molecule as it enters the light field or attaches onto the fiber taper.

This invention provides a very simple, cheap and compact scheme with a demonstrated ultra sensitive sensing performance. It uses a laser diode, a photodetector and a fiber taper with subwavelength aperture and relies on light intensity measurement. These features make it possible to build high performance and portable nanoparticle/molecule sensing instruments with much lower costs than the currently available systems. Multiple tapered fibers can be used to increase the detection efficiency without increasing the complexity.