

AXIAL LIGHT-FORCE SENSOR

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ABSTRACT

Commercially available optical tweezers can move objects using laser light, but they are generally not used to measure forces exerted on those objects, since accurate force calibration is difficult. Research in the field of optical trapping has led to the development of optical tweezers that measure forces (transverse to optic axis) by changes in light-momentum. Force calibration is greatly simplified by using this method. However, in measuring the light force on a trapped object, it is also desirable to obtain all three vector components of that force.

Representing an improvement on the light-momentum force-sensor, researchers at the University of California, Berkeley have developed an axial light-force sensor. A system incorporating the Berkeley improvement permits simultaneous measurements of the axial and transverse forces acting on a trapped particle. Like the transverse sensor, the axial force sensor is calibrated from measured constant values: the speed of light, the objective focal length, and the power sensitivity of the planar photo-diode. Thus calibration is not affected by particle shape, laser power, particle refractive index, or sharpness of the trap focus. In addition, a highly-miniaturized, ultra stable, optical trap system has been developed that should permit a low cost instrument with force-measuring capabilities for use in normal lab environments.

APPLICATIONS

- Force analysis on single cells, viruses, DNA, RNA, and other Nanomolecules
- Biophysics, enzymology research, and possibly drug discovery
- Measurement of the elastic, viscous, and structural properties of nanomolecules
- Nanomaterial structural research and molecular motor mechanics

ADVANTAGES

- Lower cost and smaller than present research devices
- Environmental effects are minimized which would lower the facility costs. Users would no longer need a vibration-free environment

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,133,132	11/07/2006	2004-011

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OTHER INFORMATION

KEYWORDS

lasers, instrumentation, optics, equipment, atomic probe, atomic probe: microscopy, sensors, Nanotech, imaging, materials

CATEGORIZED AS

- » **Nanotechnology**
 - » Materials
 - » Tools and Devices
- » **Optics and Photonics**
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- » **Semiconductors**
 - » Design and Fabrication
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