

Optical Torque Wrench

Angular Trapping, Rotation, and Torque Detection of Quartz Microparticles

**OPTICAL TORQUE WRENCH: ANGULAR TRAPPING, ROTATION,
AND TORQUE CONTROL OF CHARGEABLE MICRORODOLLES**

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 We describe an approach for the estimation of angular displacement and torque applied to a passive prosthesis in a healthy human leg. Torque was estimated by detecting the change in angular momentum of the instrumented leg segment. The rotational Inverse Dynamic of the target position was used to generate a reference signal to estimate the angular leg position. The response latency in healthy subjects to changes in torque or other external positions. The torque sensitivity demonstrated is ideal for the study of human biological systems.

the ratio of the total ion currents to the total current of the detector has been determined by making appropriate dilutions. One set of test, blank, and reference samples is used for each determination. The detection limit is approximately 10% of the blank sample. The detection limit is 10% of the blank sample. The detection limit is 10% of the blank sample.

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FIG. 1. (a) A photograph of a micro-rotary stage used to align the sample with the field. The sample stage is tilted at an angle to the horizontal so that the axis of rotation lies approximately in a vertical plane. (b) A schematic diagram of the micro-rotary stage.

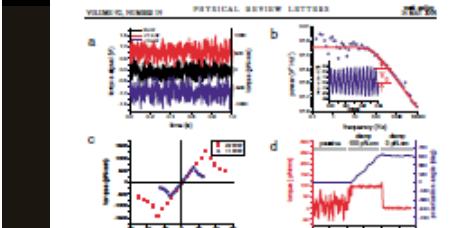


Fig. 2. (Continued) (a) The measured line for a particle rotating in opposite directions at 123 cps, and nearly constant at 23 cps. The effect is a reversal of the sign of the mean and the broadened lines are primarily due to the Lorentz factor and the effect of the different rotation rates. (b) The measured line for a particle rotating in opposite directions at 123 cps, and nearly constant at 23 cps, showing polarization results (200 cps). The amplitude of ± 0.07 implies a small enough angle sensitivity of $\pm 0.01^\circ$ at 23 cps. From the data of Fig. 2(b), the angle of the linear region is about $\pm 1.5^\circ$, which corresponds to a polarization angle of $\pm 1.5^\circ$. Hence the range of the linear region is about $\pm 1.5^\circ$ at 23 cps. (c) The measured line for a particle rotating in opposite directions at 123 cps, and nearly constant at 23 cps.

variable deviation from spherical shape, defining the radius of the particle to be considered roughly spherical. When the sphericality of a shape has to be tested, it can be determined using the torque distance, which has only two locally differentiable

The enhancement of the torque being at 1 g plane gain in 10% relative to a value in Eq. (1) is due to the effect of the magnetic field on the torque values. The final results have been verified by the numerical simulation of the magnetic field in a similar way. This is also in the literature of authors but it is possible to neglect the effect of the magnetic field or to consider the effect of the magnetic field as zero. The results of the numerical simulation are shown in Fig. 10.



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of the larger areas available in the polychaete lugles. During the initial part of the study, the lugles provided both small-scale and large-scale distributions of the surface sediments, which were later modified by the burrowing lugles. When digested, the polychaete lugles contained 1–3 mm size fractions of $100\text{--}150\text{ }\mu\text{m}$ in the fine fractions, with 20–30% of the weight. When reduced to a $1\text{--}2\text{ }\mu\text{m}$ size fraction, the lugles contained 1–2 mm size fractions of $100\text{--}150\text{ }\mu\text{m}$, which were slightly smaller than the original. Although the lugles decreased their burrowing endurance over time, they

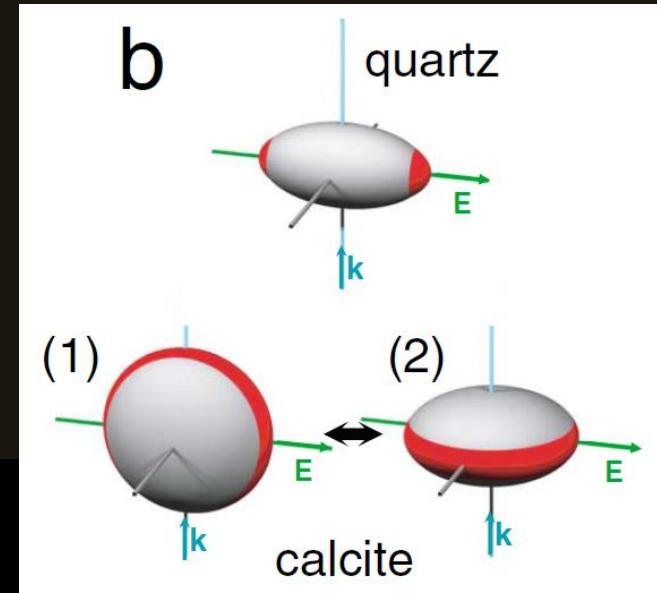
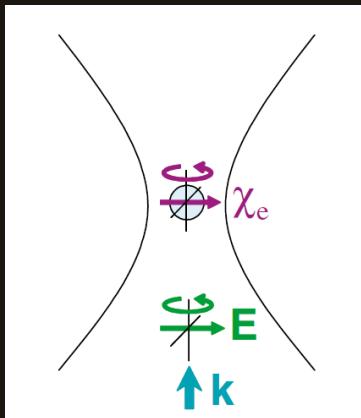
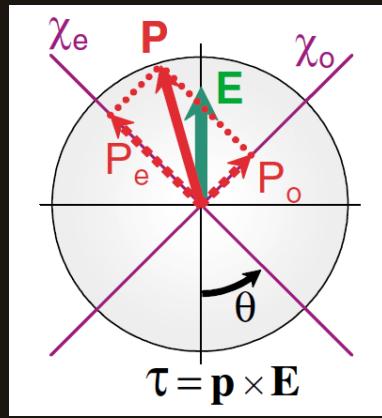
order, as also has to be used in addition to the α -helix model to describe the structure of the protein [1].

We thank Dr. S. G. Vainshtein for help in developing the MD method and the calculations of the conformational changes of the proteins. We also thank Dr. V. N. Kostyuk for help in the experiments on the synthesis of the proteins and their characterization [12], and Professor V. V. Vorob'ev for his support of this work. This work was partially supported by grants from the Russian Foundation for Basic Research, from grants-in-aid of scientific researches of the Russian Academy of Sciences, and from the Ministry of Education of the Russian Federation.

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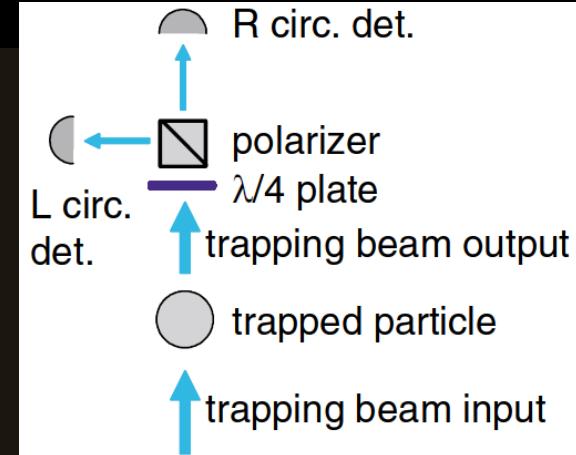
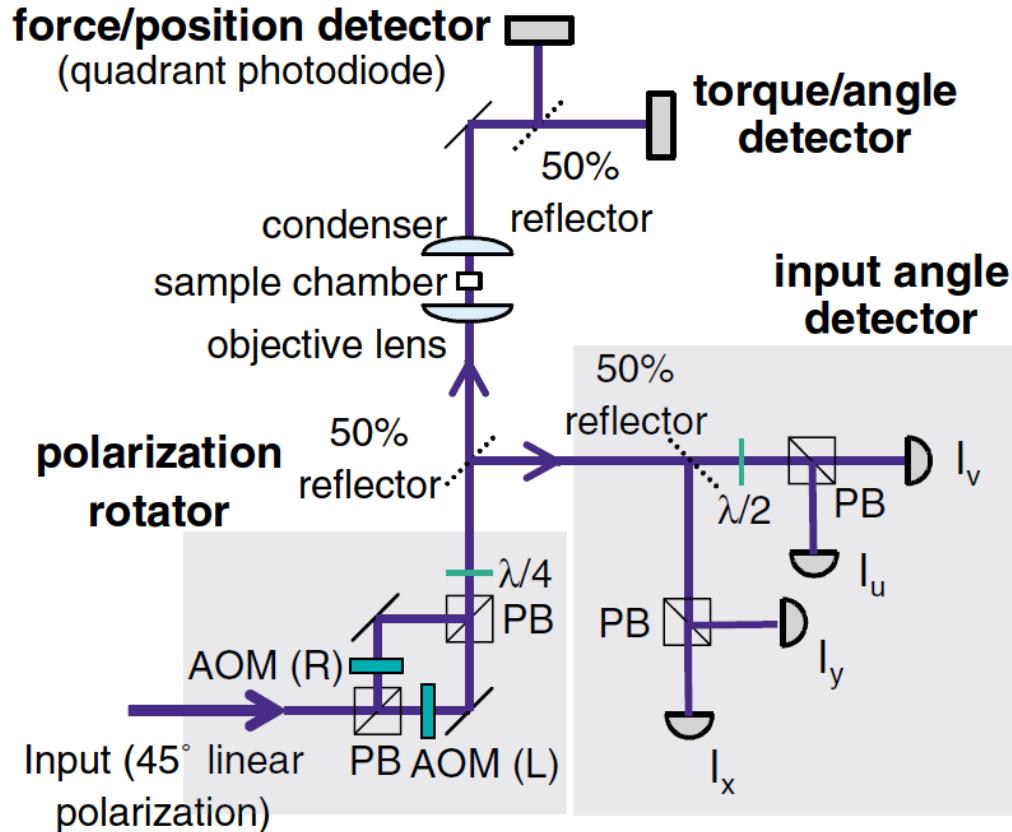
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more money than time in research or production.



positive

negative

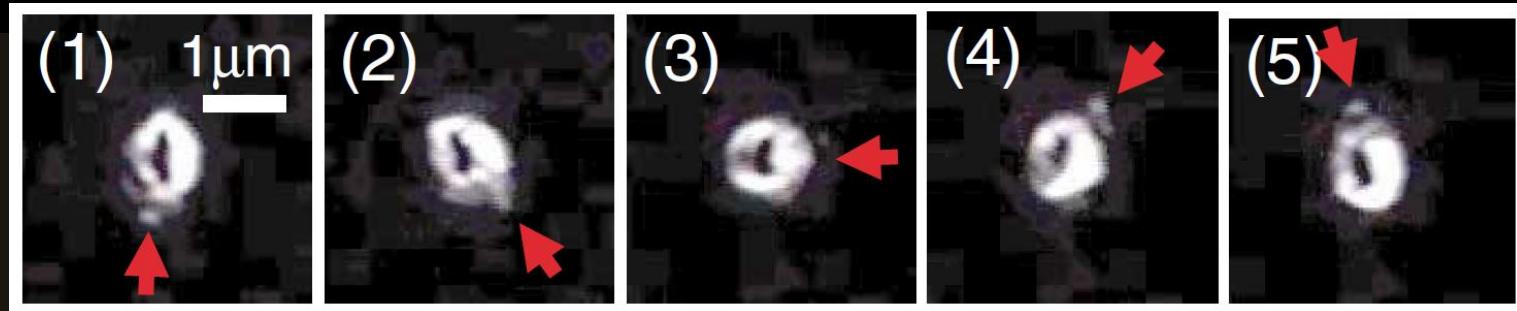


$$\tau = (P_R - P_L) / \omega_0$$

P_R or L : power of right- or
left-handed circular polarization
 ω_0 : optical angular frequency

Visualization of the rotation of a quartz particle

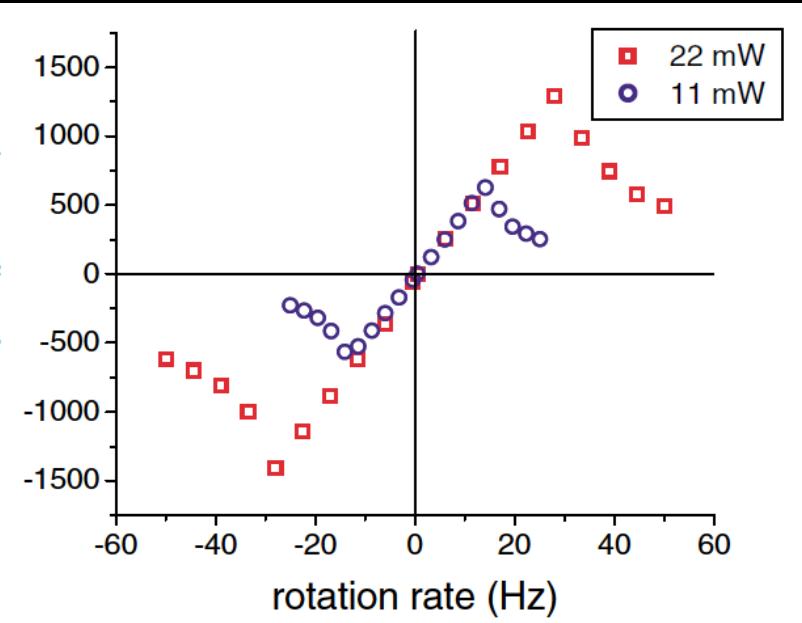
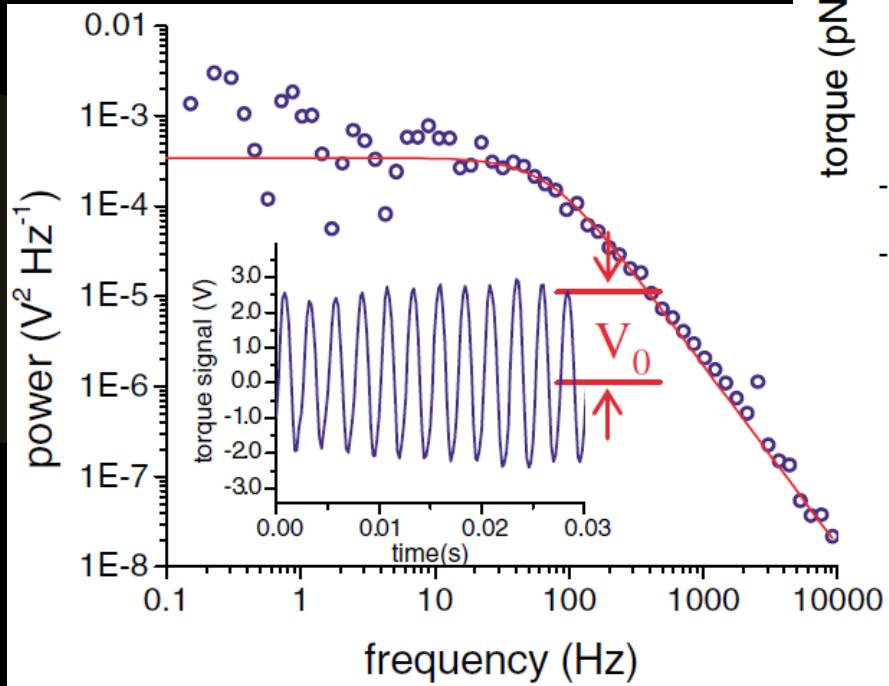
Controlled by polarization

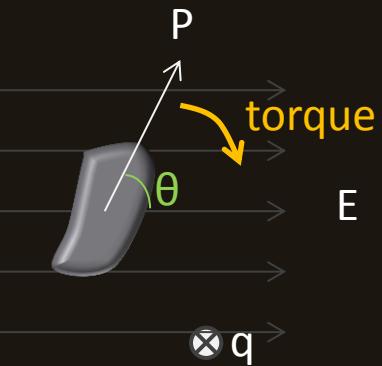
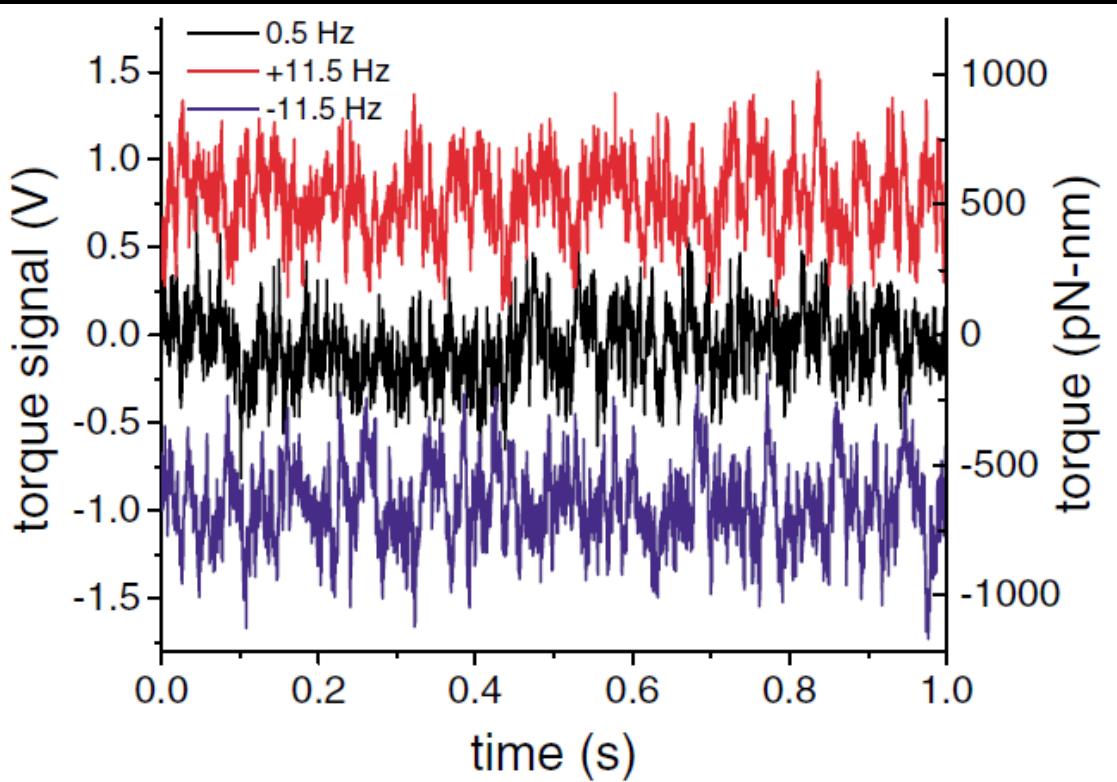


1um dia quartz particle in the angular trap

250ms time interval

Calibration

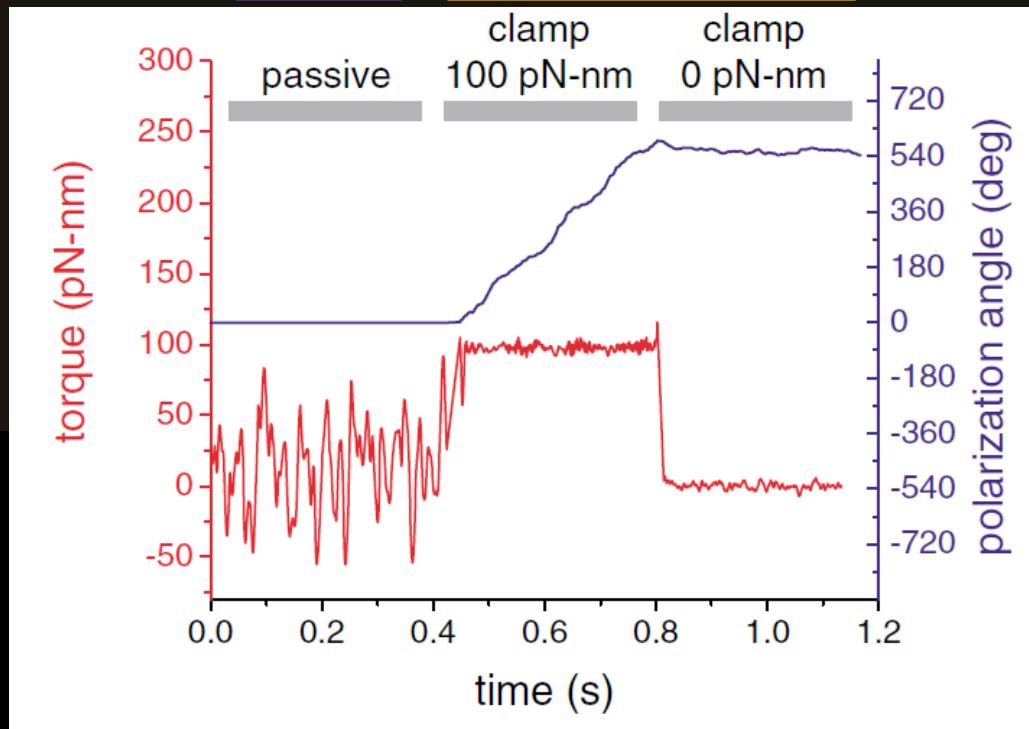




$$\tau = (P_R - P_L) / \omega_0$$

Brownian
fluctuation

Constant
torque



Angular Trapping
w. constant torque