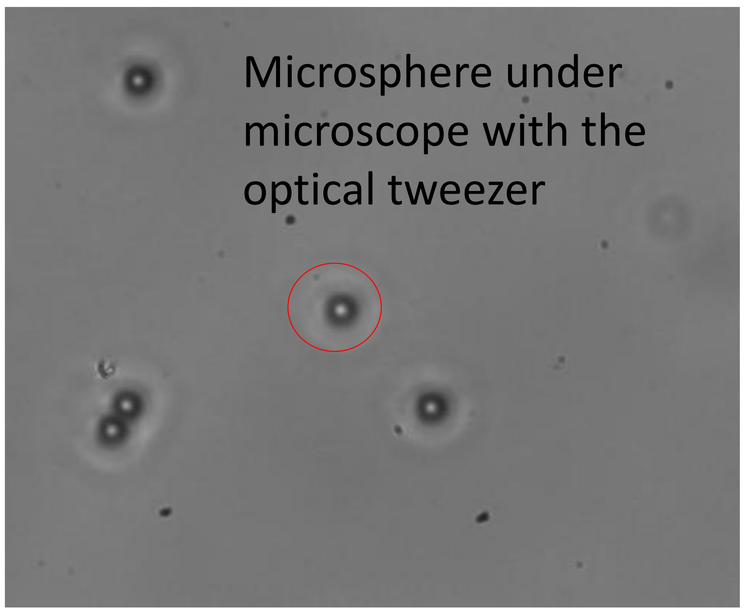
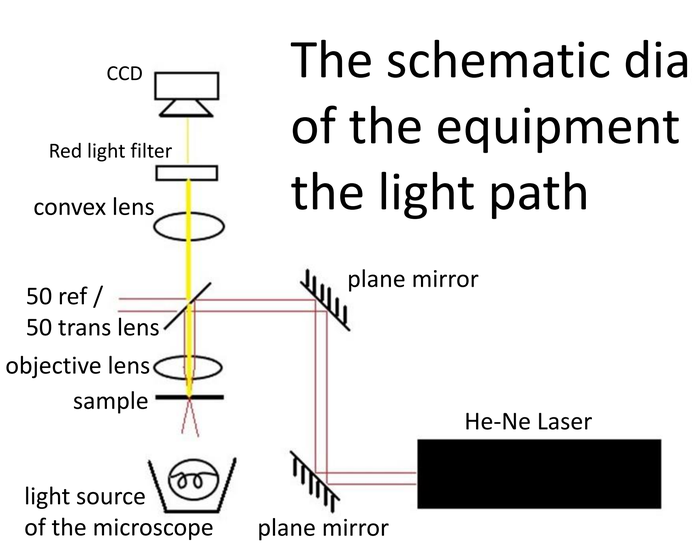
Optical Tweezer: Construction and Measurement of the Trap Force

Lee Chi (李奇) & Yao Yu-hao (姚禹豪)
T.A.: Chen No (陳諾) & Tsai Cheng-en (蔡承恩) , Instructor：Professor Chen Peilong (陳培亮)

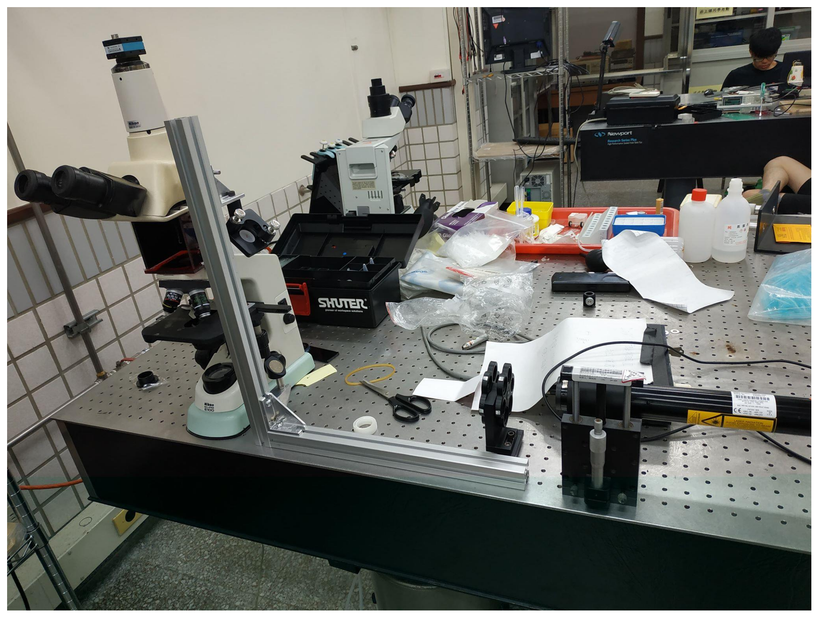
Abstract

We constructed an optical tweezer by modifying a microscope and succeeded to trap some microparticles. We tried to develope a new method to measure the trap force constant of an optical tweezer by using overdamped motion formula and also found out some relations between trap force constant and diameter of the microsphere.

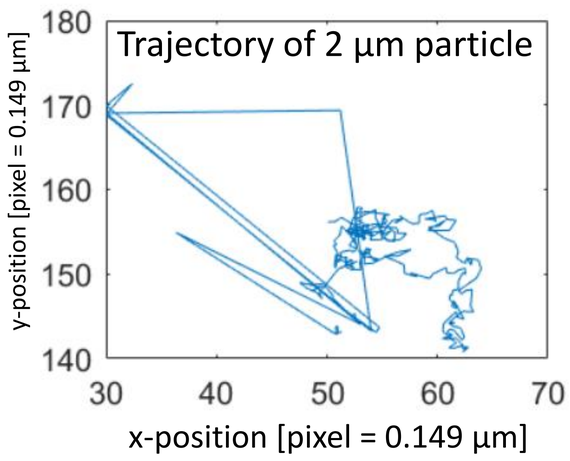


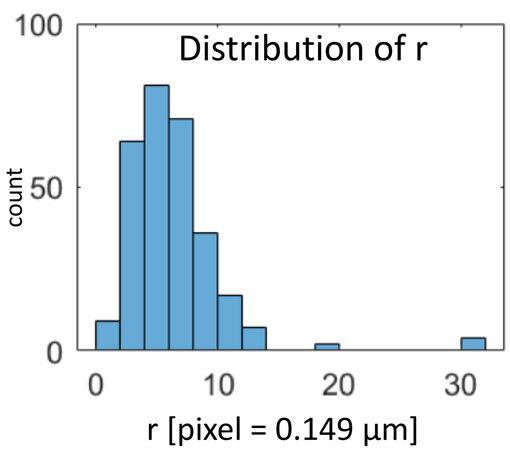


The schematic diagram of the equipment and the light path

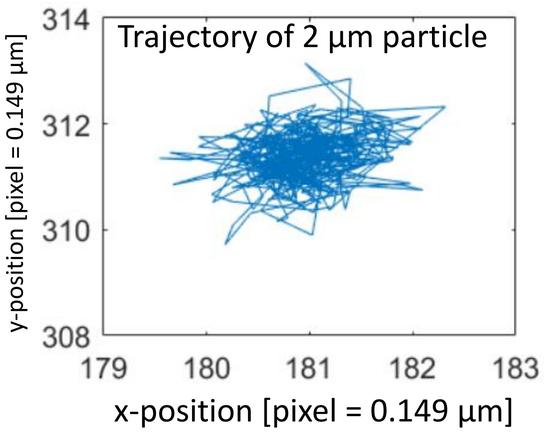


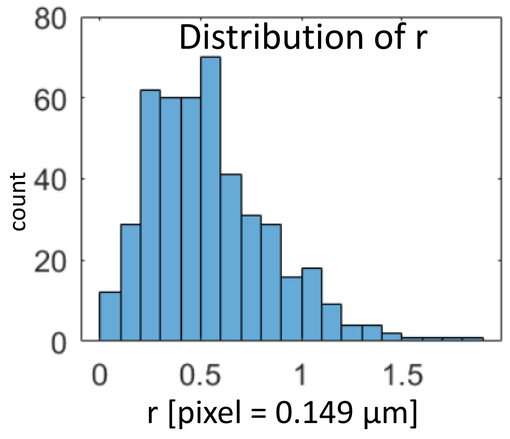
Without the optical tweezer

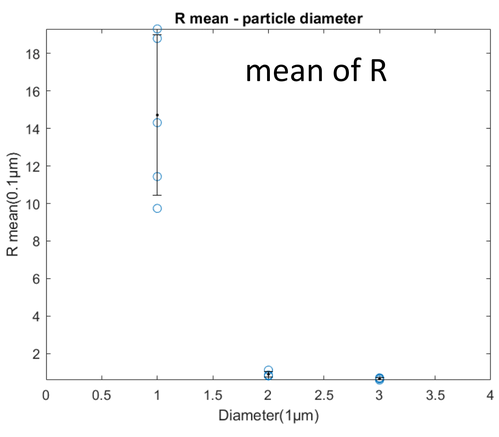


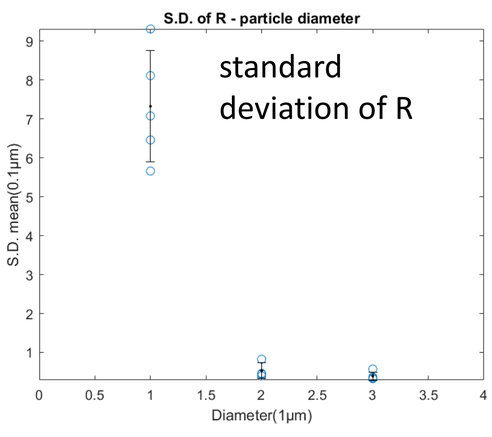


With the optical tweezer

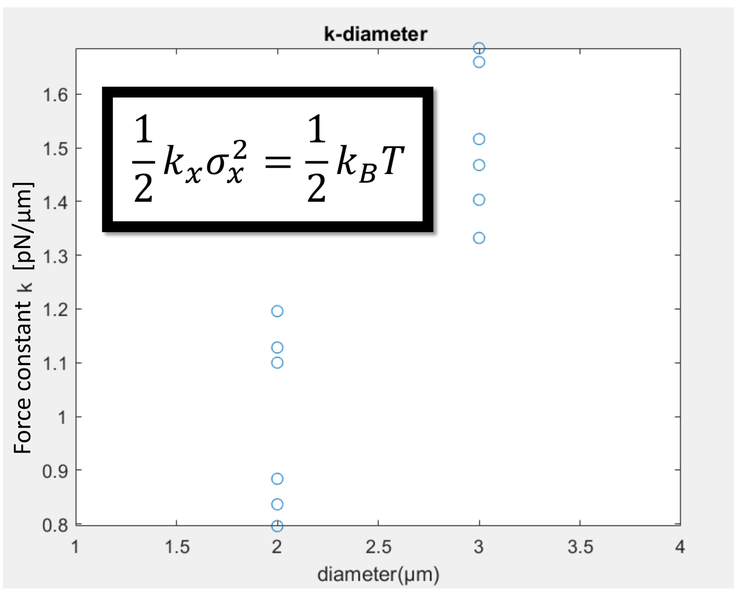


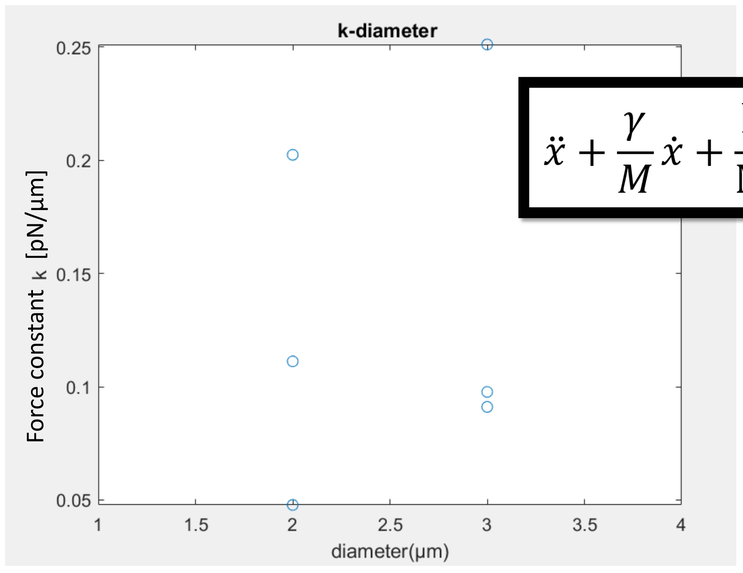






Stiffness





Conclusion

1. We found how to construct an optical tweezer by using a He-Ne laser generator and modifying a microscope.
2. The greater the diameter of a trapped microsphere is, the greater the trap force is.
3. It is possible to measure and calculate the force constant by using overdamped formula. We have to do more experiments to check its accuracy.

Reference

1. “光學嵌住之理論探討” , 吳崇安, 黃鈞正, 邱爾德 (2000)
2. “光鉗的製作與其特性的了解” , 陳永昇, 國立成功大學 (2002)
3. “Wavelength dependence of optical tweeze trapping forces on dye-doped polystyrene microspheres” , M. J. Kendrick, D. H. McIntyre, and O. Ostroverkhova (2009)