



Universiteit
Leiden
The Netherlands

Optical manipulation and study of single gold nanoparticles in solution

Ruijgrok, P.V.

Citation

Ruijgrok, P. V. (2012, May 10). *Optical manipulation and study of single gold nanoparticles in solution*. *Casimir PhD Series*. Casimir PhD Series, Delft-Leiden. Retrieved from <https://hdl.handle.net/1887/18933>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/18933>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/18933> holds various files of this Leiden University dissertation.

Author: Ruijgrok, Paul Victor

Title: Optical manipulation and study of single gold nanoparticles in solution

Date: 2012-05-10

We combine optical trapping and far-field optical detection techniques as a novel approach to study single metal nanoparticles in solution. We demonstrate the first measurements of the acoustic vibrations of single gold nanoparticles optically trapped in water, and find evidence for intrinsic damping mechanisms. Additionally, we explore the potential of single gold nanorods as ultra-small mechanical actuators: we quantify the optical forces and torques on a single trapped gold nanorod (25 nm diameter and 60 nm length) and show that the rod can simultaneously exert forces and torques that would be large enough to manipulate single (macro-) molecules. We developed techniques to measure the combined translational and rotational Brownian motion of a trapped nanorod. We determine the rod's heating by the trap beam and show that translational and rotational Brownian motion of a hot particle are described by different effective temperatures and viscosities.

Optical manipulation and study of single gold nanoparticles in solution

Paul V. Ruijgrok 2012

Optical manipulation and study of single gold nanoparticles in solution



Paul V. Ruijgrok

Casimir PhD series 2012-10
ISBN: 978-90-8593-122-5