



Universiteit
Leiden
The Netherlands

Plasmonic enhancement of one-photon- and two-photon-excited single-molecule fluorescence by single gold nanorods

Zhang, W.

Citation

Zhang, W. (2018, June 27). *Plasmonic enhancement of one-photon- and two-photon-excited single-molecule fluorescence by single gold nanorods*. *Casimir PhD Series*. Retrieved from <https://hdl.handle.net/1887/62864>

Version: Not Applicable (or Unknown)

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

Downloaded from: <https://hdl.handle.net/1887/62864>

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

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/62864> holds various files of this Leiden University dissertation

Author: Zhang, Weichun

Title: Plasmonic enhancement of one-photon- and two-photon-excited single-molecule fluorescence by single gold nanorods

Date: 2018-06-28

Stellingen

behorende bij het proefschrift

Plasmonic Enhancement of One-Photon- and Two-Photon-Excited Single-Molecule Fluorescence by Single Gold Nanorods

1. When conducting plasmon-enhanced single-molecule studies, there exists no perfect positioning strategy for placing single molecules with respect to plasmonic nanoantennas.
Chapters 2, 3, 4 and 5 of this thesis.
2. Because of its low quantum yield and complicated photochemistry, methylene blue may not be the best molecular probe for measuring the local redox potential in a cell.
Chapter 3 of this thesis.
3. Because of the size distribution of quantum dots, the enhancement factor by a nanoantenna can only be accurately determined by measuring with and without the nanoantenna for *the same* quantum dot.
Chapter 5 of this thesis.
4. Gold nanorods' shape instability upon femtosecond laser irradiation is the major hurdle for their application in single-molecule two-photon-excited fluorescence enhancement.
Chapter 6 of this thesis.
5. In addition to what is reported by the Halas and Maier groups, the gold-thiol bond can also be cleaved by a focused continuous-wave laser.
Goodman et al., ACS Nano 11, 171-179 (2017) and Simoncelli et al., ACS Nano 12, 2184-2192 (2018).
6. The axial super-resolution method proposed by Isbaner *et al.* based on metal-induced energy transfer requires prior knowledge of the fluorescent molecules and is not able to super-resolve two different molecules along the optical axis.
Isbaner et al., Nano Lett. 18, 2616-2622 (2018).
7. Although the reported enhancement factors remain lower than for the metal counterparts, all-dielectric nanoantennas are promising alternatives because of their lower sensitivity to laser heating.
Regmi et al., Nano Lett. 16, 5143-5151 (2016).
8. For achieving brighter fluorescent molecular probes for two-photon microscopy, it is easier to enhance the brightness of the existing two-photon absorption fluorophores physically than, as is often proposed, to seek for new molecules with larger two-photon absorption cross-sections.
Albota et al., Science 281, 1653-1656 (1998).
9. "Problem solved" is not equivalent to "problem understood" in experimental physics.

10. In undesired effects of some research lies the opportunity for future research.

Weichun Zhang
Leiden, June 27, 2018