Plasmonic enhancement of single-molecule fluorescence under one- and two-photon excitation

Lu, X.

Stellingen

behorende bij het proefschrift

Plasmonic Enhancement of Single-Molecule Fluorescence under One- and Two-Photon Excitation

1. Compared to strong emitters, weak emitters with low quantum yields experience a stronger fluorescence enhancement by plasmonic nanoantennas, yet it doesn't mean they can be brighter.
   Chapter 2, 3 of this thesis.

2. A trade-off between the excitation rate and the fluorescence enhancement is normally needed to optimize the enhanced brightness for the ultra-weak emitters with large Stokes shifts.
   Chapter 3 of this thesis.

3. A simple strategy of sandwiching gold nanorod assemblies with two slides can "freeze" the assembly process at the dimer stage, enriching the fraction of dimers on the glass surfaces.
   Chapter 4, 5 of this thesis.

4. End-to-end gold nanorod dimers with open gaps of $\sim 5\ \mathrm{nm}$ make it possible to detect the two-photon-excited single-molecule fluorescence, through an enhancement of up to seven orders of magnitude.
   Chapter 2, 5 of this thesis.

5. Nanoparticle-on-mirror systems offer sub-nm cavities with enhancement factors up to 10^8 for two-photon-excitation, yet the hotspots are inaccssible to fresh molecules.
   O. S. Ojambati et al., Nano Lett. 20, 4653 (2020)

6. Plasmonic nanoantennas can not only change the intensity but also the shape of the emission of fluorescent molecules.
   M. Ringler et al., PRL 100, 203002 (2008).

7. A hierarchical assembly approach consisting of template-particle and particle-particle interactions ensures the fabrication of heterodimer with precise addressability.
   J. Li et al., Nano Lett. 19, 4314 (2019).

8. Quantum effects should be considered seriously when the plasmonic particles are placed apart at the atomic length scale.
   K. J. Savage et al., Nature 491, 574-577 (2012).

9. "Perfect" is sometimes the enemy of "good enough" in optical experiments.

Xuxing Lu
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