

Gold Nanoparticle-Assisted Fluorescence Analysis of Surface-Bound DNA Origami

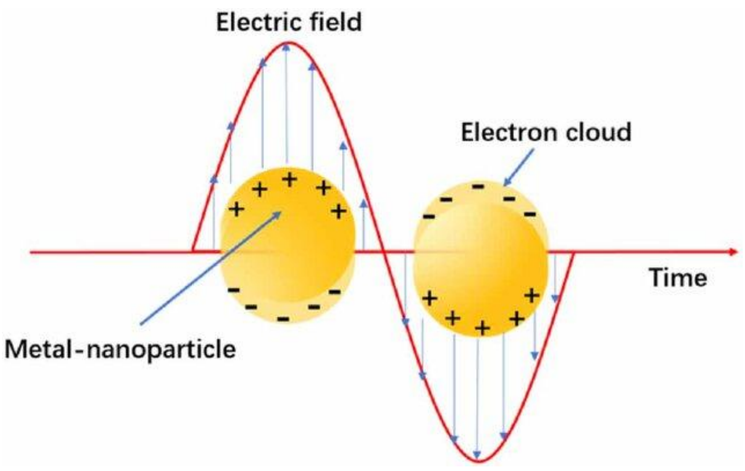
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Introduction

LSPR (**Localized Surface Plasmon Resonance** – coherent oscillations of conduction electrons confined to the nanoparticle surface) is characterized by alternating regions of electron density enhancement and depletion. Notably, the wavelength of these plasmonic oscillations is shorter than that of the excitation wavelength, resulting in unique optical behaviors that are highly sensitive to changes in the surrounding environment. These properties underpin a broad range of applications, including biosensing, imaging, and nanophotonic devices.



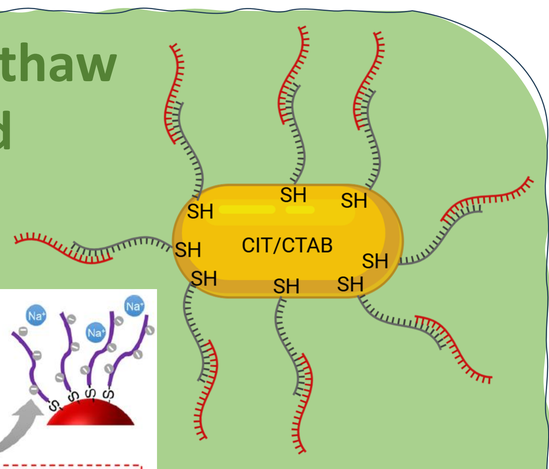
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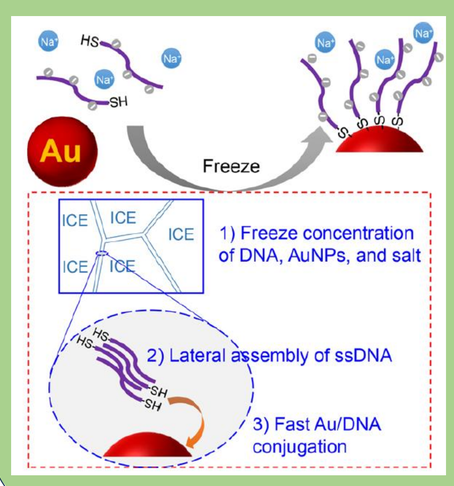
Conclusion

The most effective freeze–thaw approach was **post hybridization**, which involved an initial freezing step for thiol-DNA adsorption onto AuNPs, followed by the addition of complementary docking strands and a second freeze–thaw cycle to facilitate their hybridization.

Methodology: qPAINT (quantitative Points Accumulation In Nanoscale Topography)

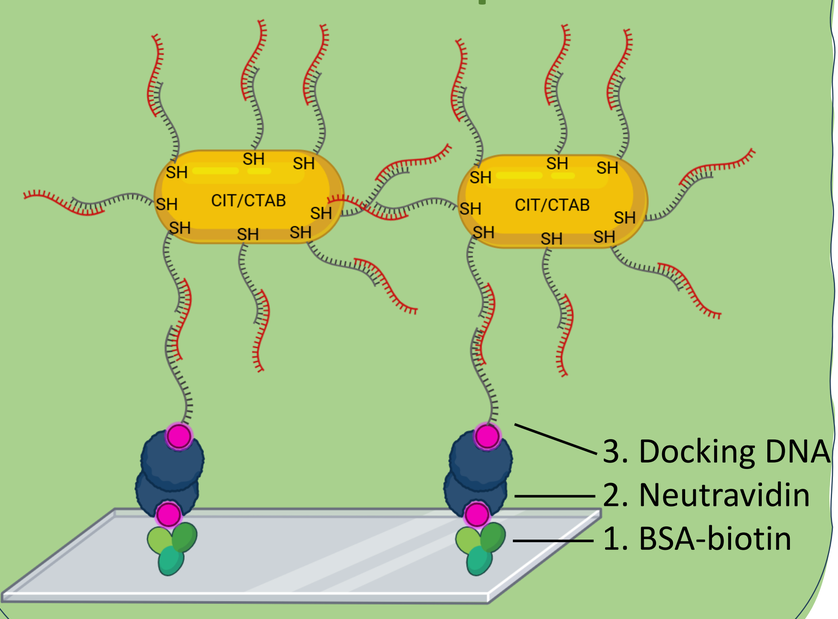
1 Freeze-thaw method



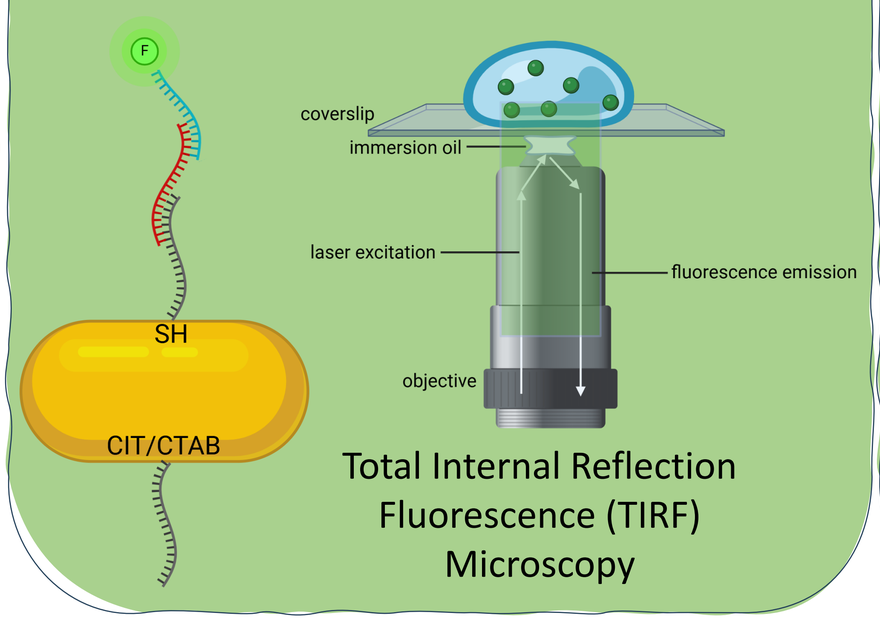


10.1021/acs.langmuir.9b00746

2 Functionalization of the coverslip

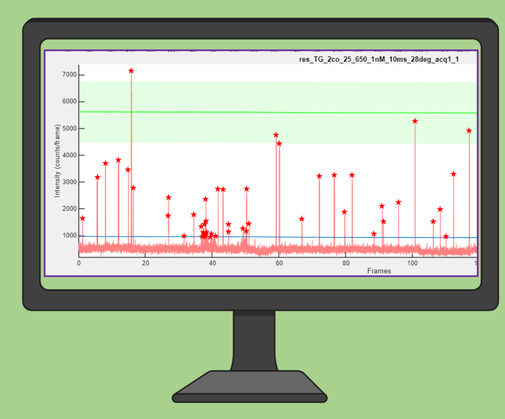


3 Fluorescent labelling and microscopy

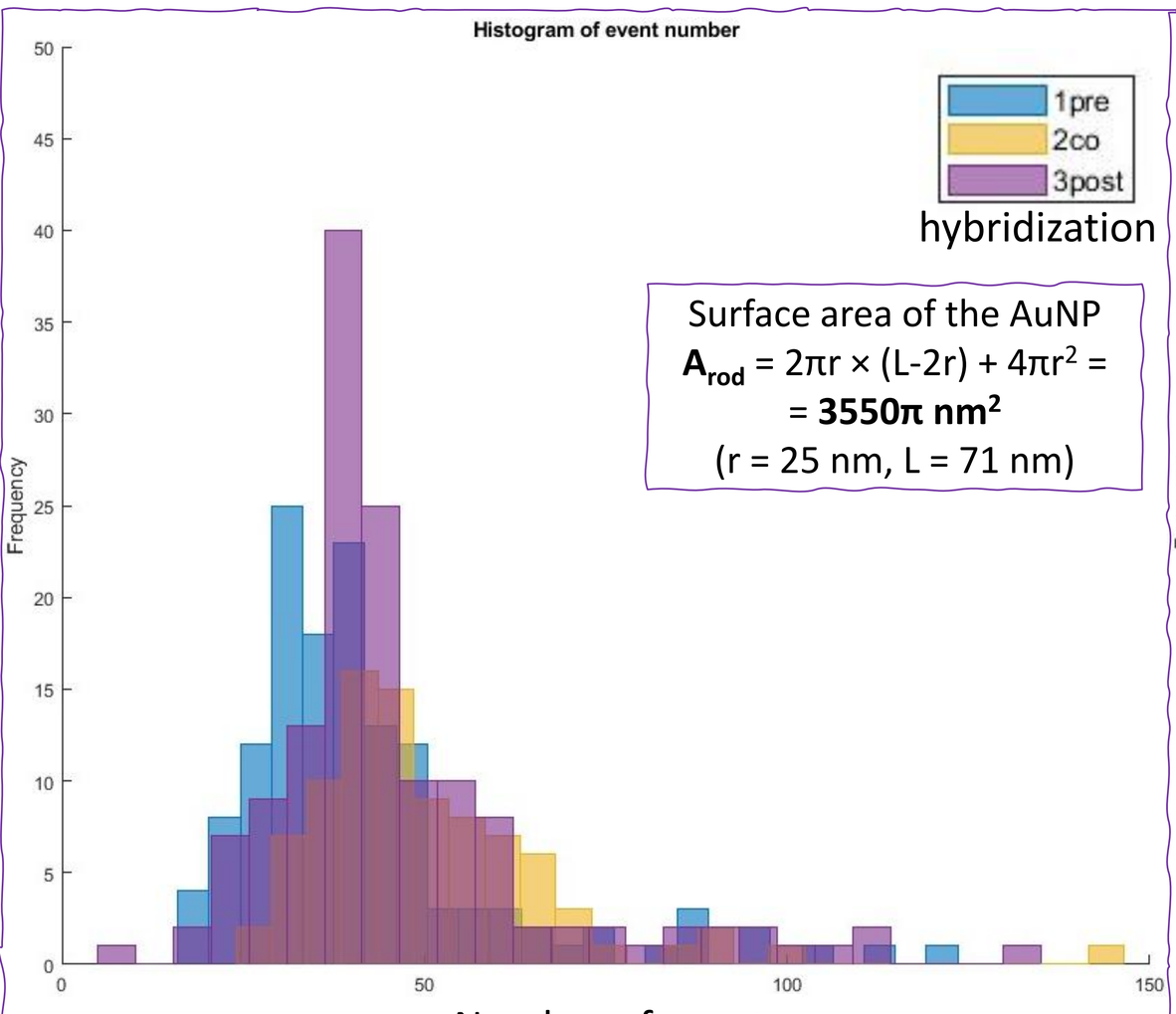


Total Internal Reflection Fluorescence (TIRF) Microscopy

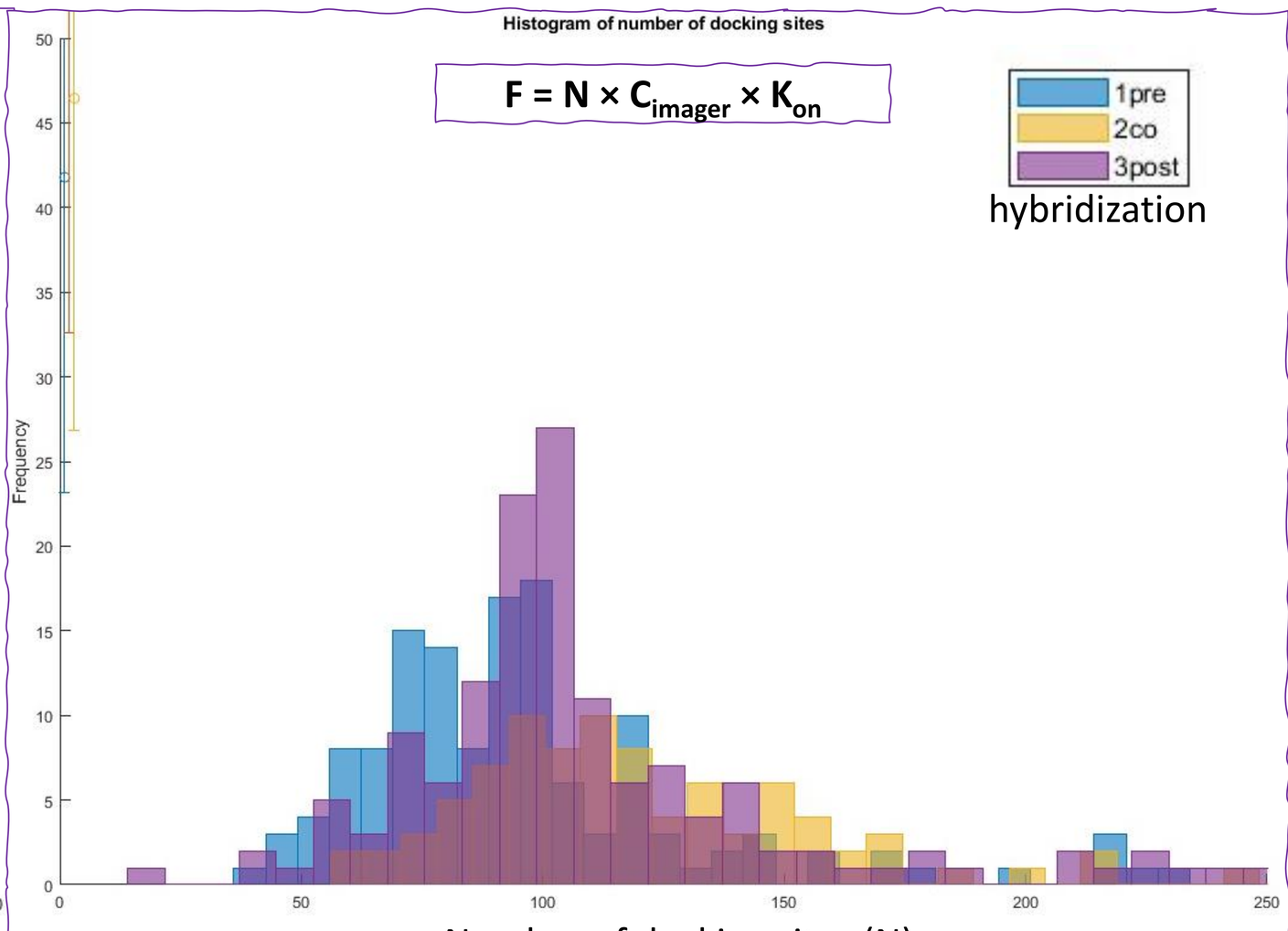
4 Data evaluation



- ImageJ (Fiji)
- Plasmon
- SPectrA
- Matlab



Surface area of the AuNP
$\mathbf{A_{rod}} = 2\pi r \times (L-2r) + 4\pi r^2 =$
$= \mathbf{3550\pi\ nm^2}$
(r = 25 nm, L = 71 nm)



$$F = N \times C_{imager} \times K_{on}$$

References:
- K. R. Okholm et. al, Single-Molecule Multivalent Interactions Revealed by Plasmon-Enhanced Fluorescence, *ACS Nano* 2024, *18* (52), 35429-35442
- M. Liu et. al, Heterostructure nanocomposite with local surface plasmon resonance effect enhanced photocatalytic activity—a critical review, *J. Phys. D: Appl. Phys.* 2022, 55 043002

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