DNA-nanoparticle hybrids for single-molecule sensing

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Biofunctionalized nanoparticles are promising constructs for molecular sensing and drug delivery. Plasmonic nanoparticles are particularly attractive because the plasmon resonance enables single molecule detection by measuring shifts of the plasmon resonance [1,2], or by exploiting the fact that the fluorescence intensity of nearby fluorophores is strongly enhanced by the plasmon [3].

The functionality of such particle-based sensors is governed by their chemical interface, specifically by the number of functional groups per particle and particle-to-particle differences. The latter can only be resolved by single-particle and single-molecule approaches, so I will first show how we use correlative microscopy to characterize the number of functional groups on single particles.

We use a combination of super-resolution microscopy, single-particle spectroscopy, and atomic force microscopy to characterize and optimize functionalization protocols. I will then show the application of such biofunctionalized particles toward single-molecule sensors that can be applied for biomedical and environmental sensing applications.

References

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