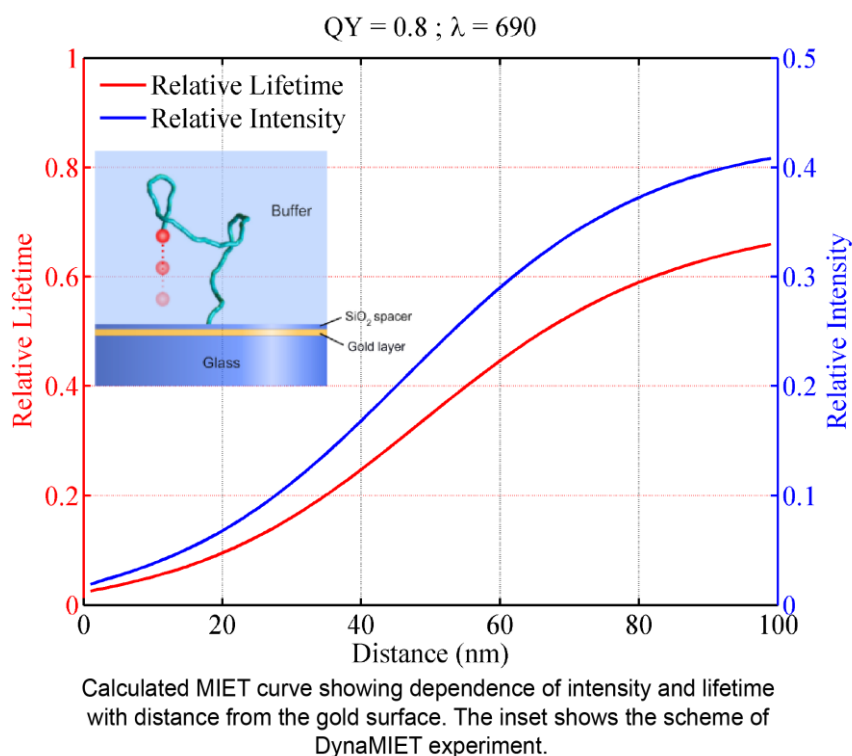


Dynamics using Metal-Induced Energy Transfer (DynaMIET)

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We report a novel single-molecule technique to probe fast conformational dynamics using Metal-Induced Energy Transfer (DynaMIET). The underlying physical basis is that a fluorescent molecule becomes increasingly quenched when approaching a metal surface, due to electro-dynamic coupling of the excited state of the molecule to surface plasmons in the metal [1]. The effect is very similar to Förster Resonance Energy Transfer (FRET), where the excited state of one dipole emitter (the donor) is electro-dynamically coupled to an optical transition in another molecule (the acceptor) [2]. In both cases, MIET as well as FRET, the intensity of the fluorophore alias donor is increasingly quenched, and its excited state lifetime reduced, with decreasing distance between the fluorescing molecule and the acceptor (metal or acceptor molecule). Here, we present proof of concept results by probing salt-dependent chain opening and closing dynamics of individual DNA-hairpin molecules immobilized on a thin gold film [3]. We also investigate and quantify the fast diffusion time of the hairpin's open state in a harmonic potential well. In conclusion, DynaMIET can be successfully applied to study sub-microsecond to millisecond conformational dynamics of biomolecules and polymer chains on length scales ca. 100 nm which is inaccessible to a conventional single-pair FRET (spFRET) experiment.



References

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