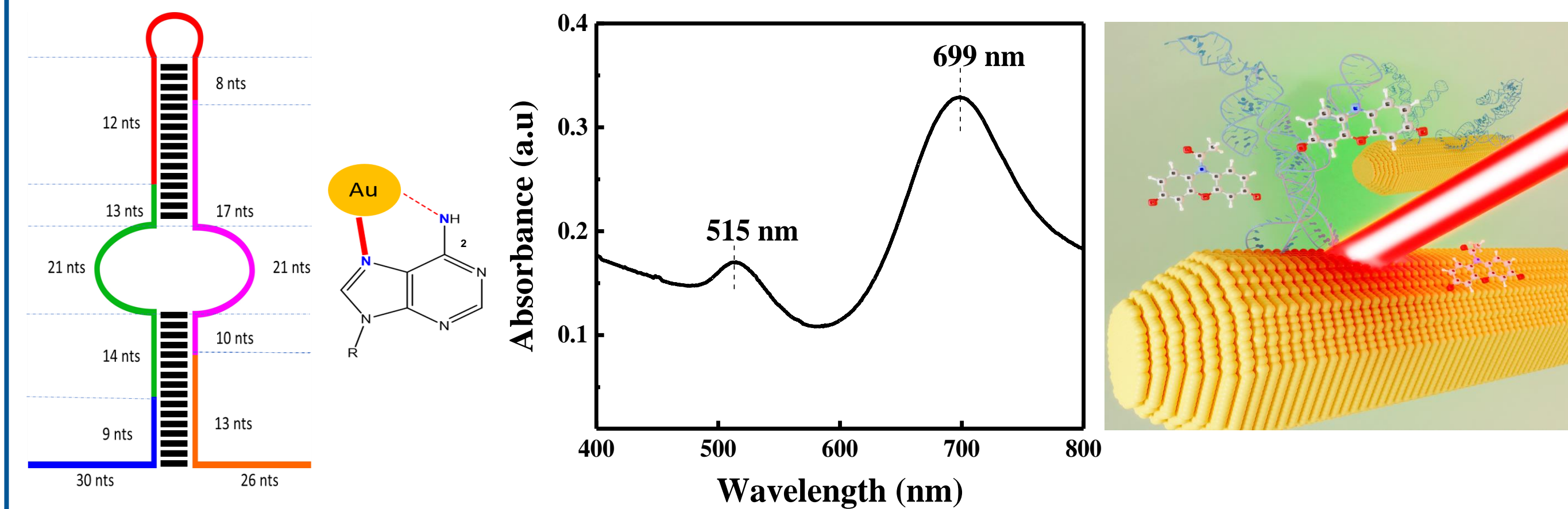


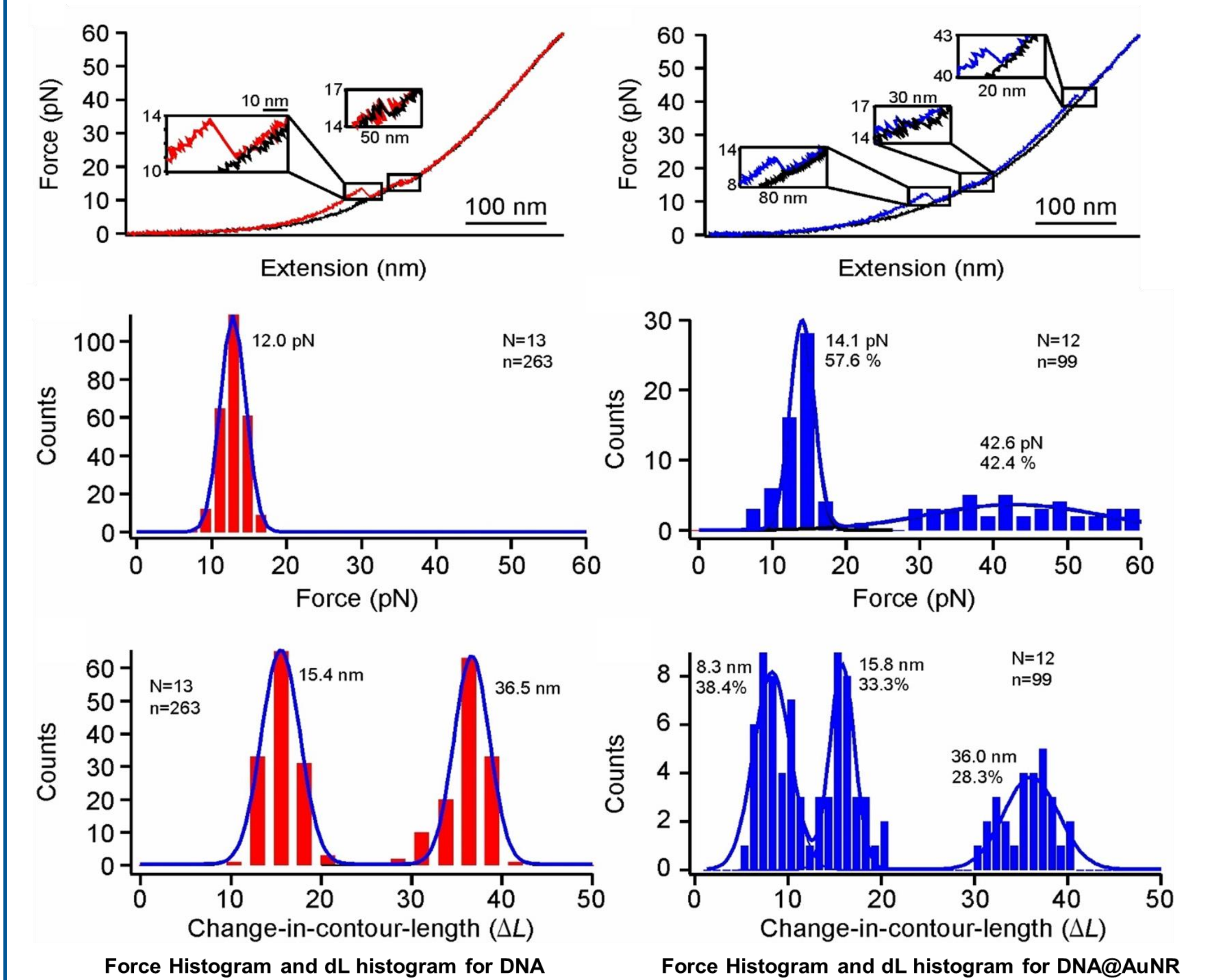
## I. Introduction

- Coronazyme with Au core and DNA surface modifications have shown superior catalytic performance.
- Chemical interface damping (CID), a plasmon-induced charge transfer at the DNA-Au interface that promotes catalytic activity, was investigated in gold nanorod coronazyme (DNA@AuNR)



- Poly (A)- DNA has A rich loop.
- Adenine/Au atoms interaction results in DNA@AuNR system.
- Plasmon peaks at ~515 nm and ~699 nm are due to transverse and longitudinal electron oscillation, respectively.
- Catalysis under external LED for plasmon excitation of coronazyme.

## II. Characterization of DNA@AuNR Coronazyme



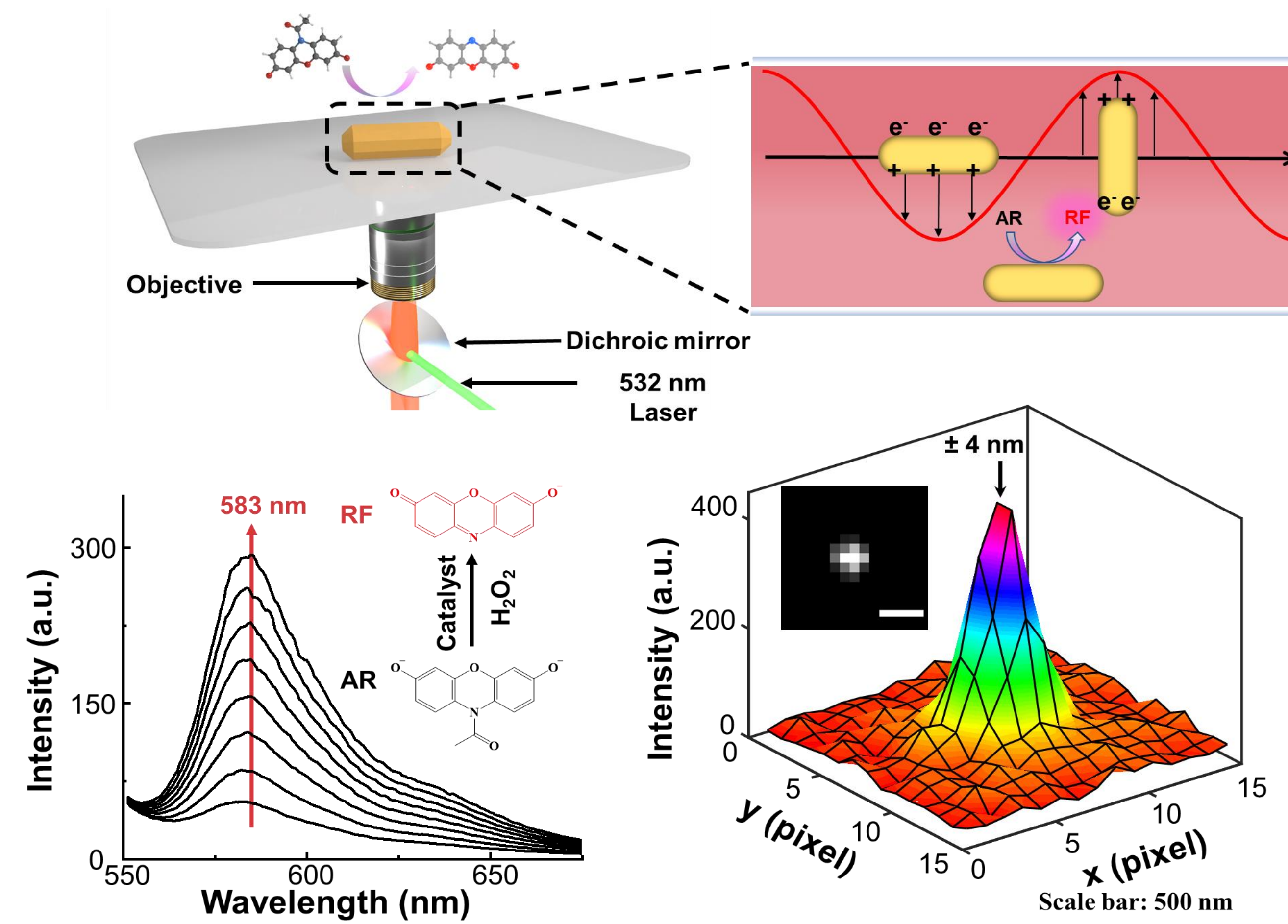
- Single particle force spectroscopy (SPFS) shows that in absence of AuNR, the unfolding of hairpin reveals characteristic rupture events of the internal loop and terminal hairpin.
- In the presence of AuNR, additional unfolding force population reveals the binding of AuNR to DNA.

## IV. Conclusion

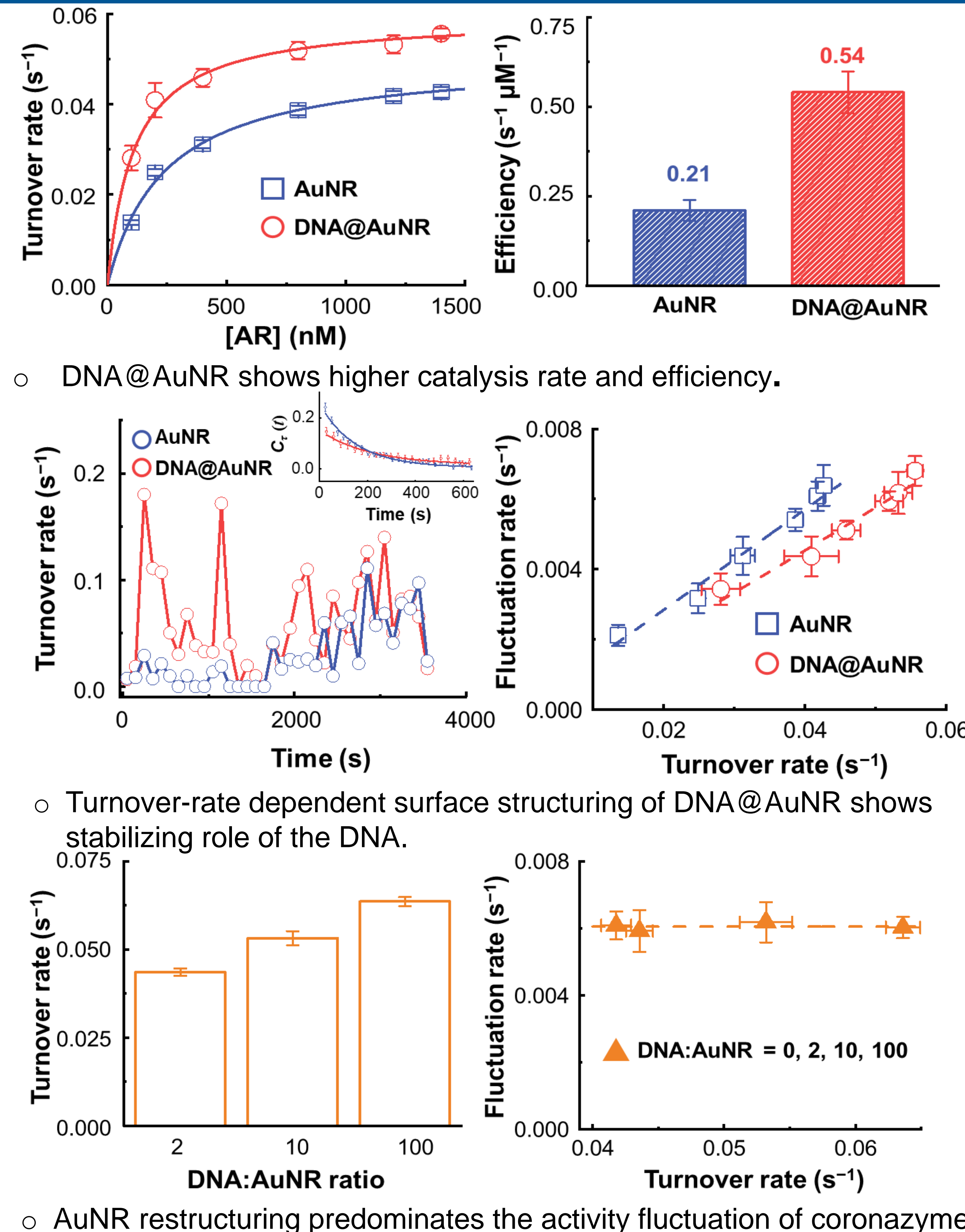
- SPFS demonstrates DNA-AuNR interaction in coronazyme system.
- DNA@AuNR shows better catalytic performance than bare AuNR.
- LSPR excitation of AuNR allows for charge transfer along the Au-DNA interface.
- Plasmon induced CID effect for enhanced and tunable catalysis.

## III. Results and Discussion

### A. Single Molecule Fluorescence Microscopy (SMFM)

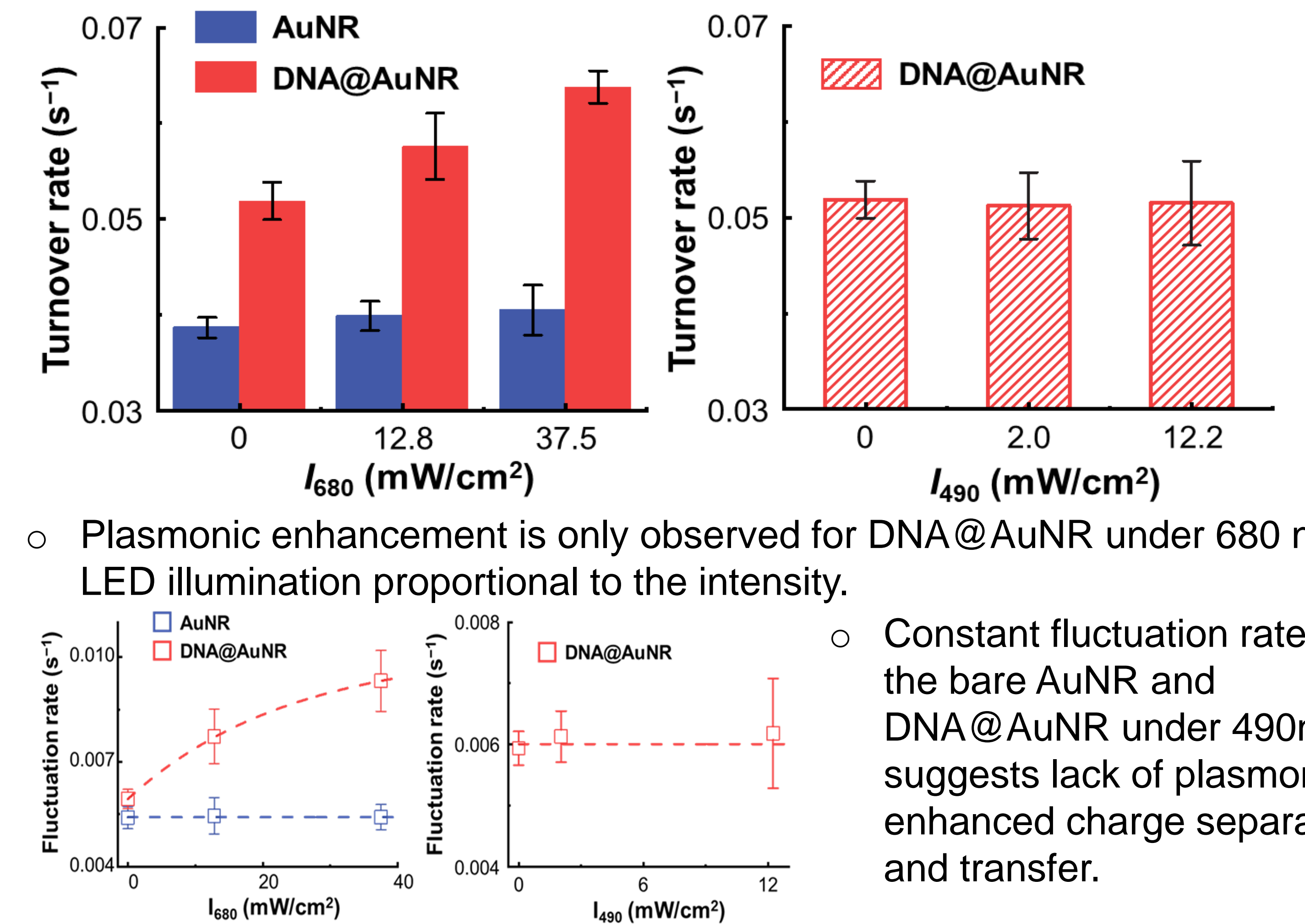


### B. Catalytic Performance and Dynamic Disorder



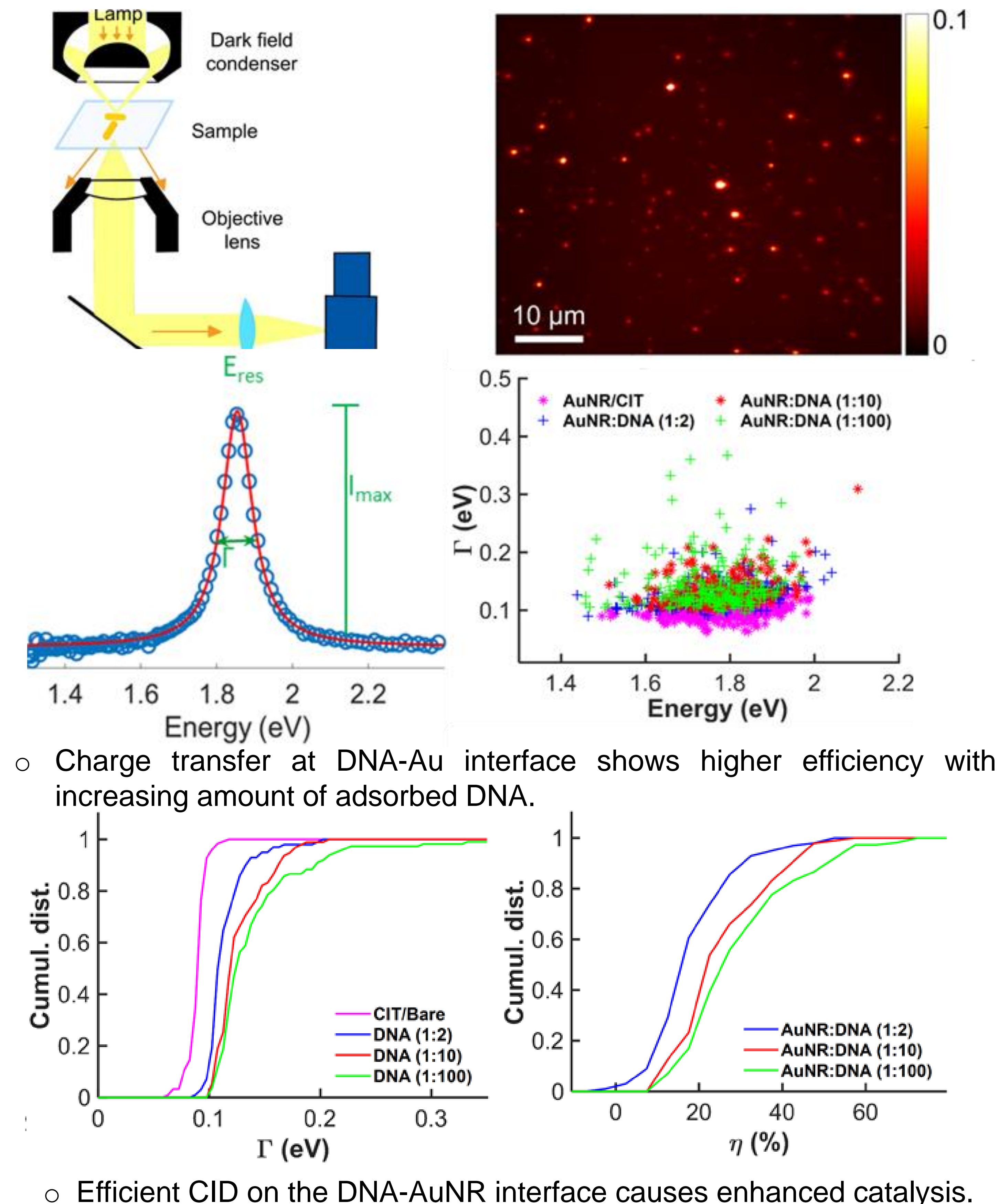
- DNA@AuNR shows higher catalysis rate and efficiency.
- Turnover-rate dependent surface structuring of DNA@AuNR shows stabilizing role of the DNA.
- AuNR restructuring predominates the activity fluctuation of coronazyme.

### C. Plasmonic Effect of DNA@AuNR Coronazyme



- Plasmonic enhancement is only observed for DNA@AuNR under 680 nm LED illumination proportional to the intensity.
- Constant fluctuation rate for the bare AuNR and DNA@AuNR under 490nm suggests lack of plasmonic enhanced charge separation and transfer.

### D. Single Particle Scattering Spectroscopy (SPSS)



- Charge transfer at DNA-Au interface shows higher efficiency with increasing amount of adsorbed DNA.
- Efficient CID on the DNA-AuNR interface causes enhanced catalysis.