

# Electronic Transport Properties of Native and Denatured Surface Immobilized Proteins

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Maintaining a native conformation allows proteins to perform their biological function. Earlier we found that several, quite different, protein types are surprisingly efficient electronic conductors, if immobilized on electronically conducting substrates in “solid-state” measuring configurations. To understand the importance of conformation for this behavior we compare monolayers of native and denatured proteins, such as Cytochrome C, which we know to have efficient electron transport.

As first step we need to see differences between such monolayers, where denaturation is done thermally or chemically and to this end we also study their UV-Vis and IR absorption on Au and Si/SiO<sub>x</sub> substrates to understand the effect of secondary structure changes. *We find protein monolayers to be remarkably resistant to denaturation.*

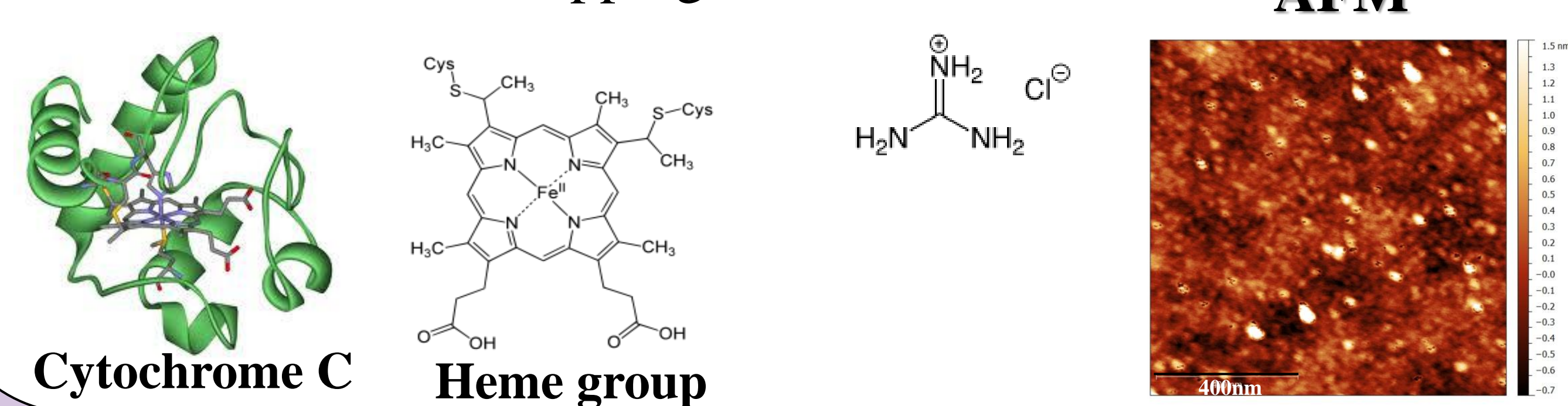
## Our approach

Physical immobilizing of Cytochrome C on silicon, quartz or gold.

Then denaturing the protein monolayer:

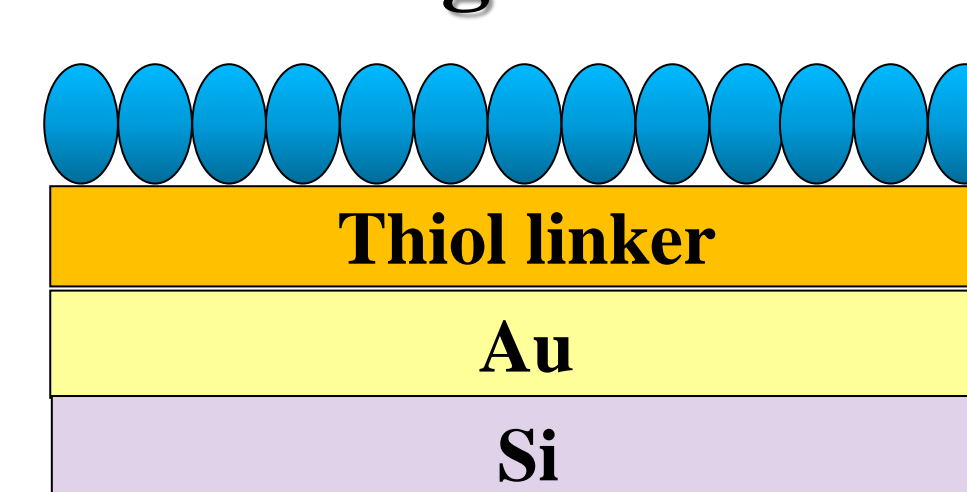
**Thermal denaturation:** heating to 100°C for 1hr

**Chemical treatment:** dipping in GuHCl

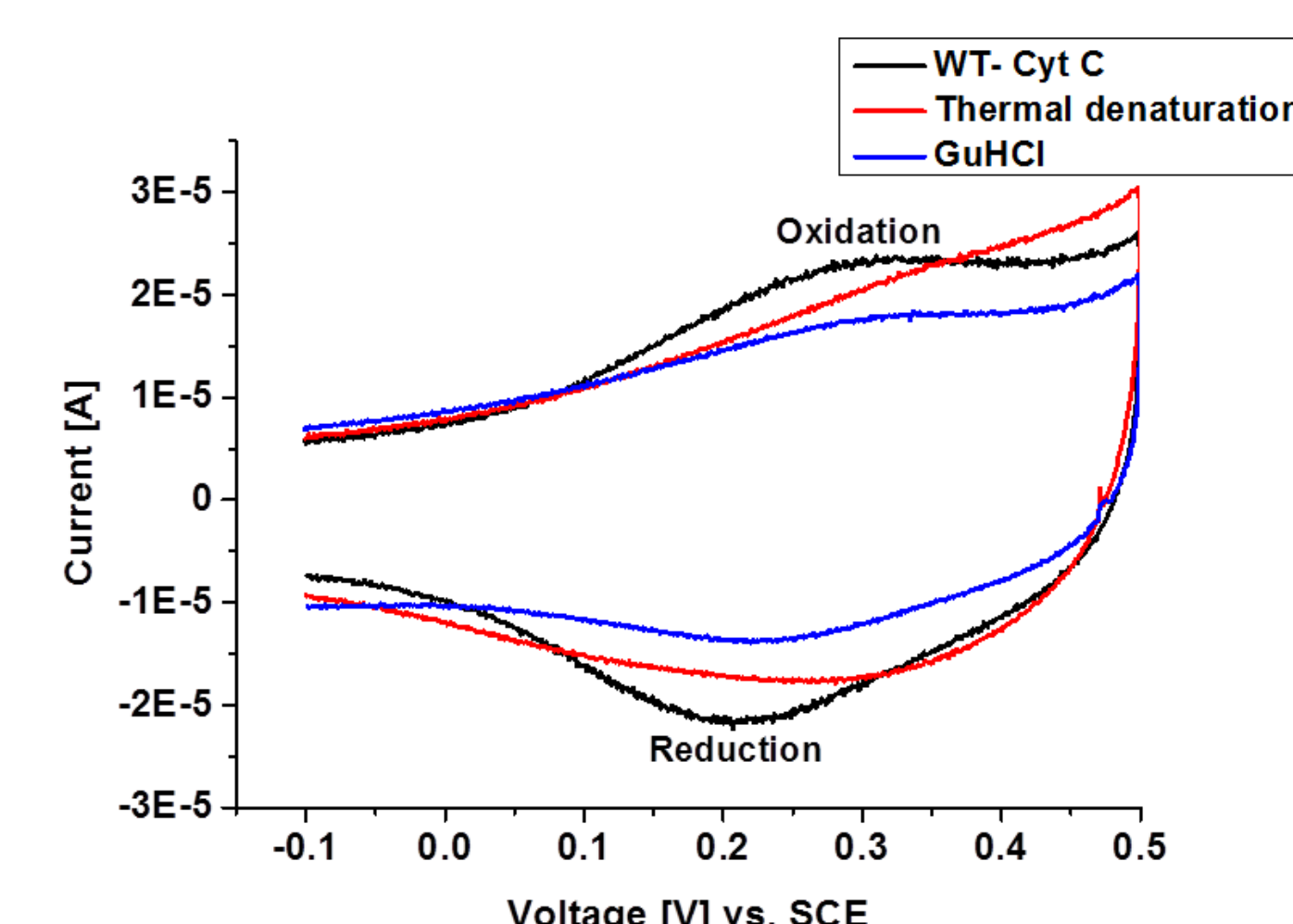
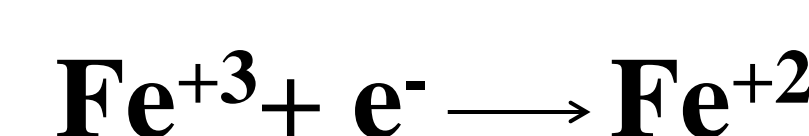


## Electrochemistry (ET)

### Configuration

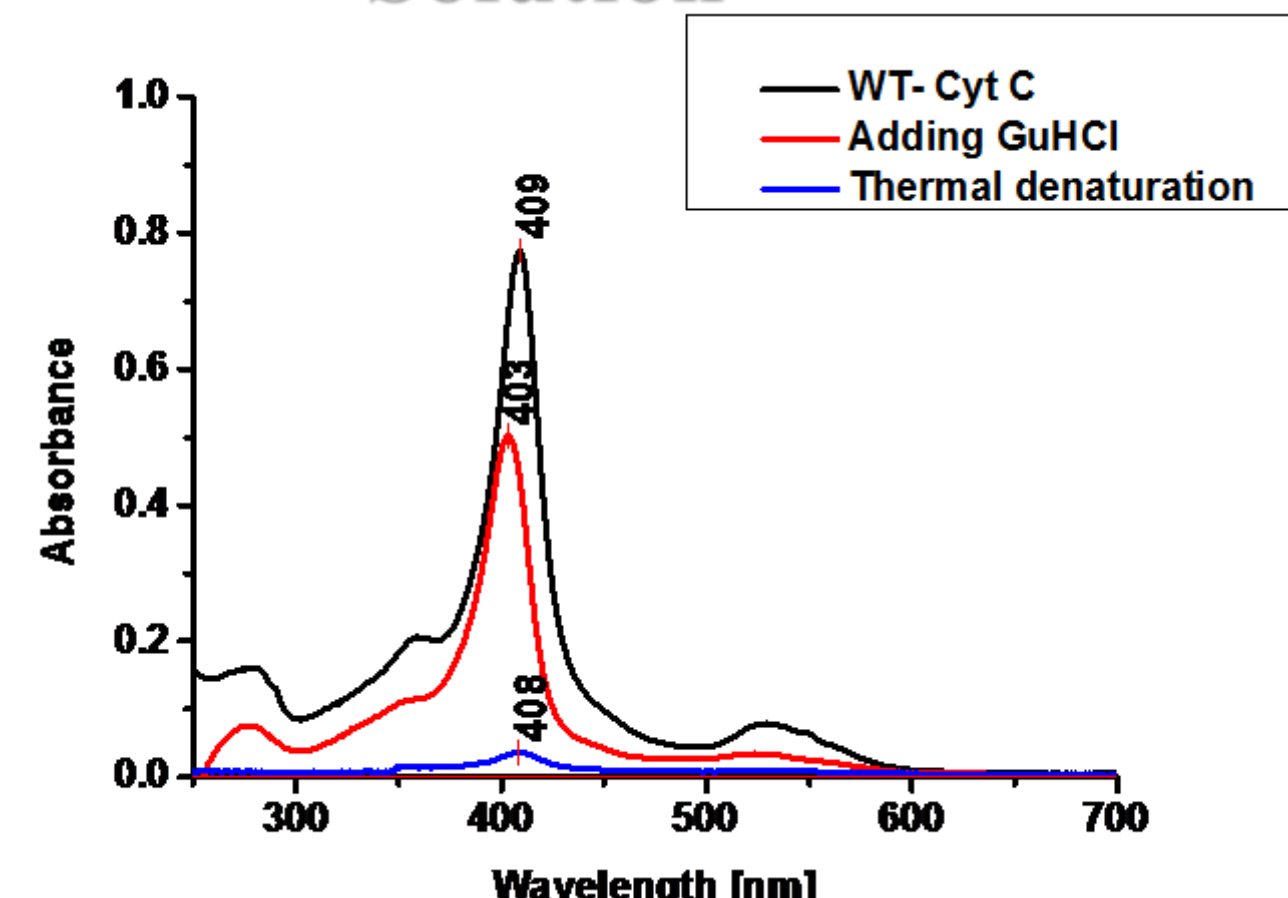


### Electron transfer reaction

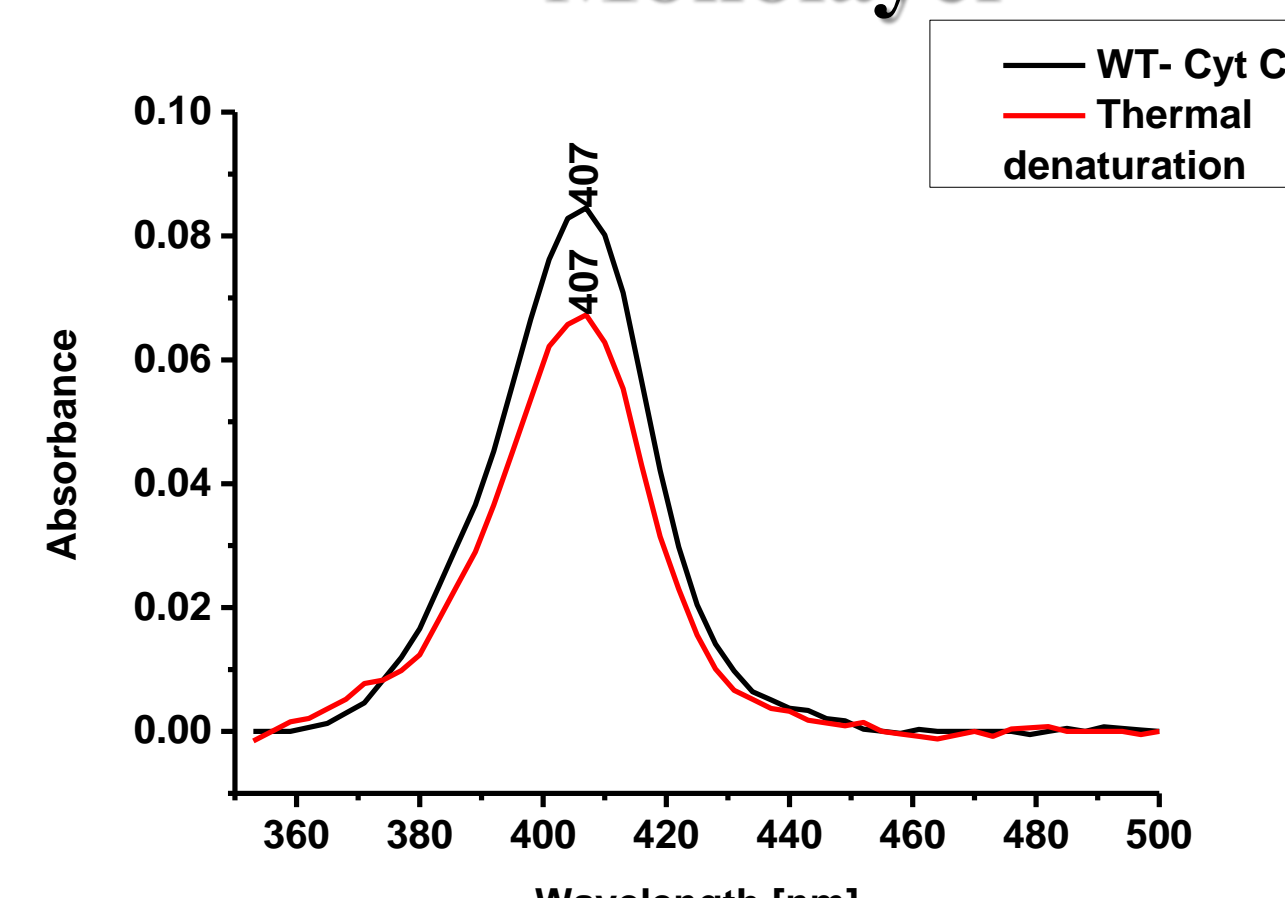


## UV-Vis absorption

### Solution

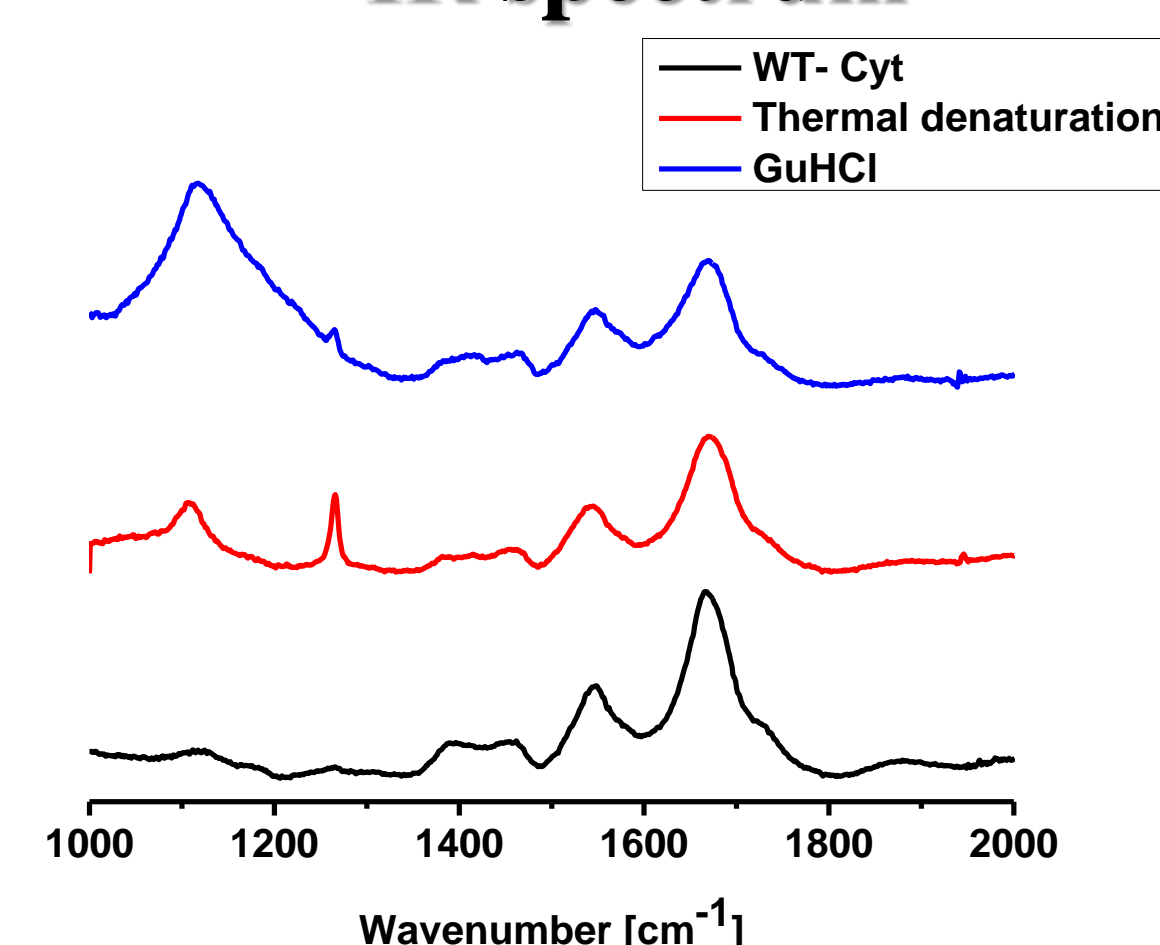


### Monolayer



## IR Spectroscopy

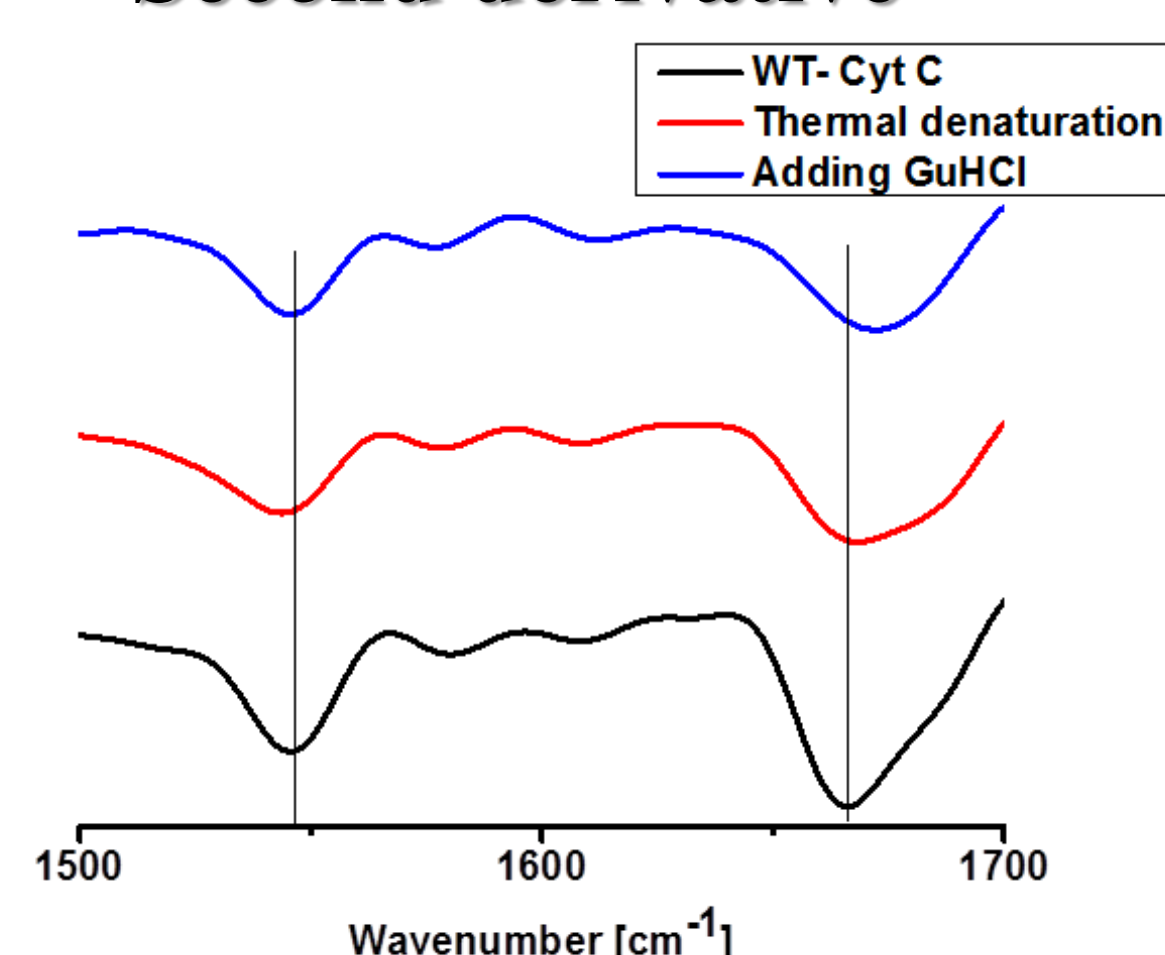
### IR spectrum



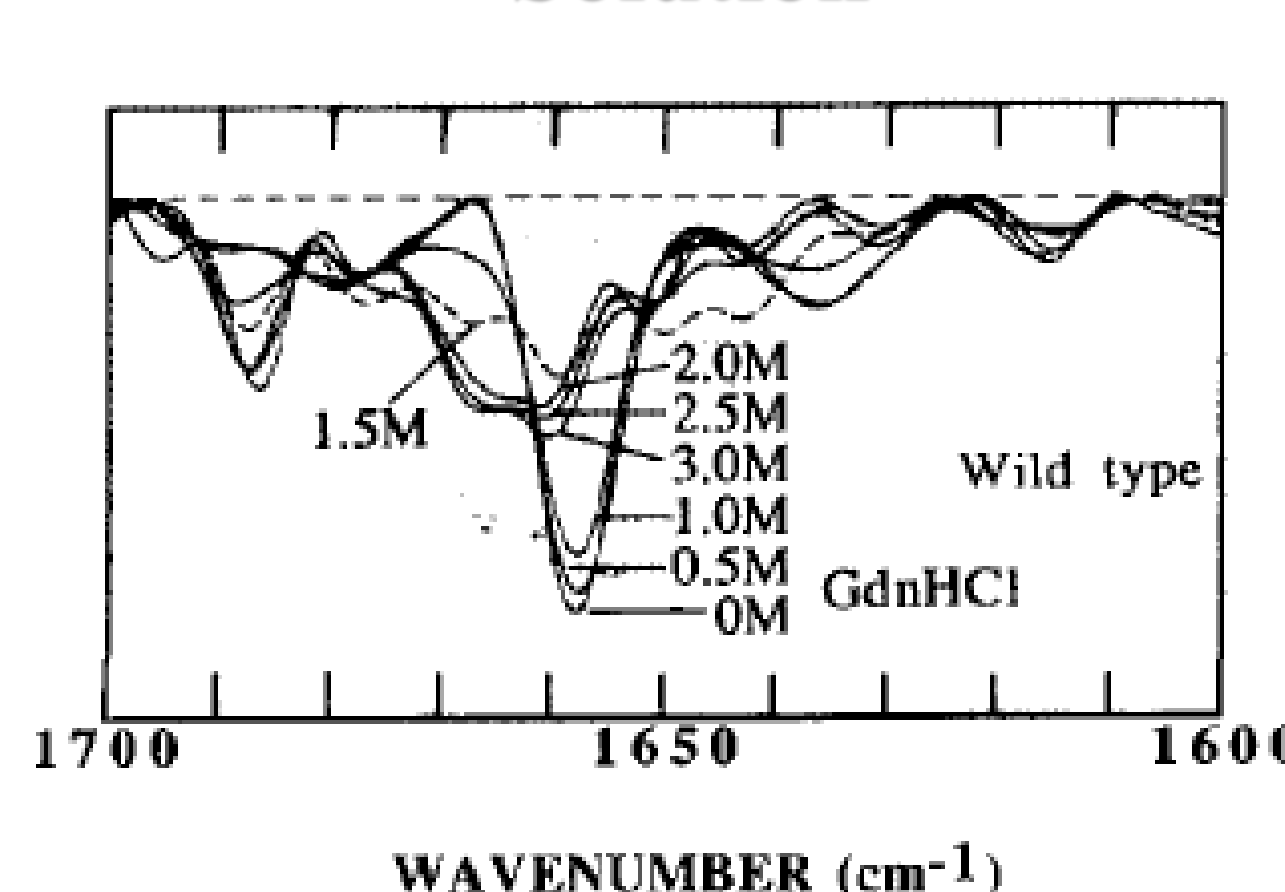
### Peak positions [cm<sup>-1</sup>]

	Amide I	Amide II	CH deformation	NH stretch
WT- Cyt C	1666	1549	-	-
Thermal denaturation	1669	1545	1266	-
Adding GuHCl	1669	1548	1266	1118

### Second derivative

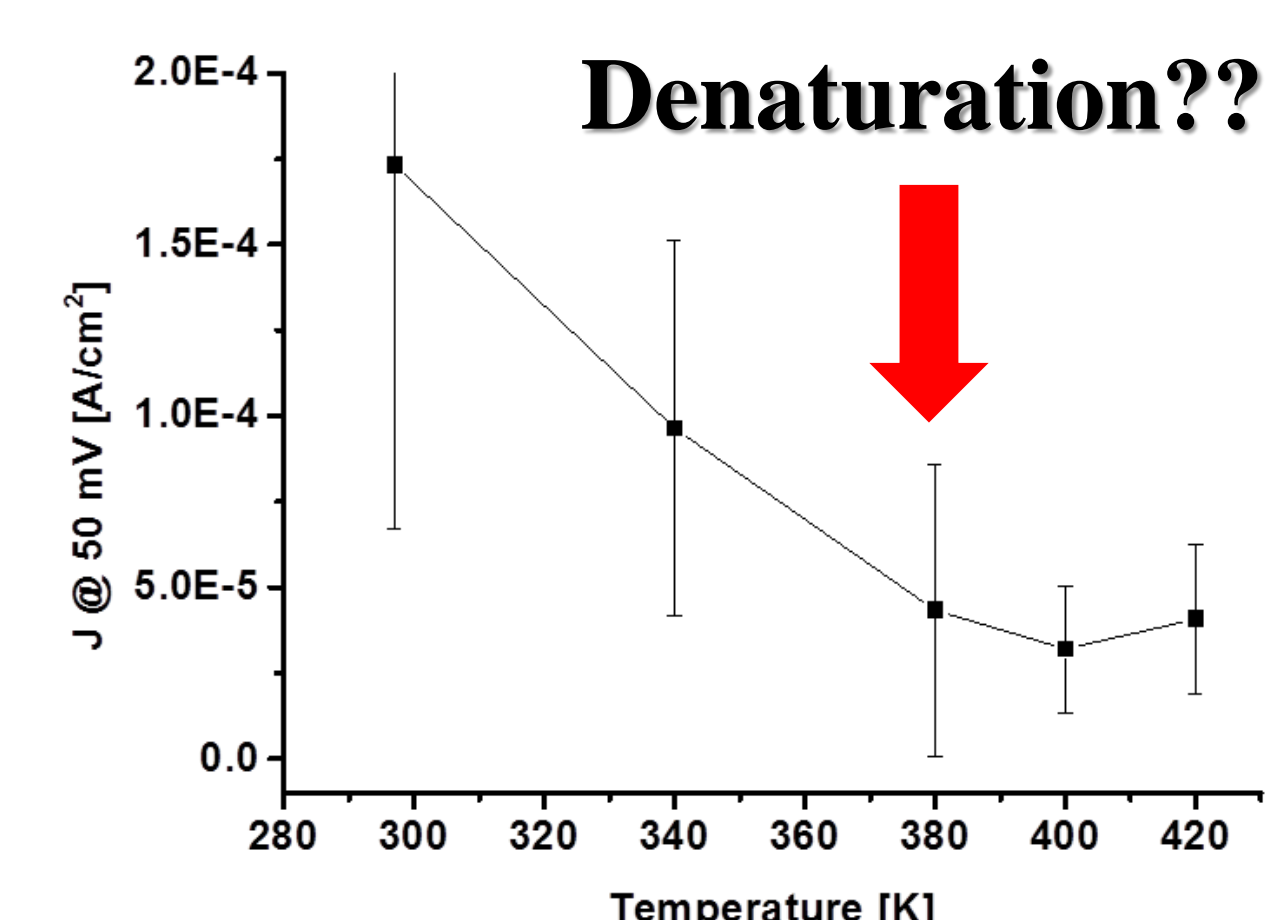
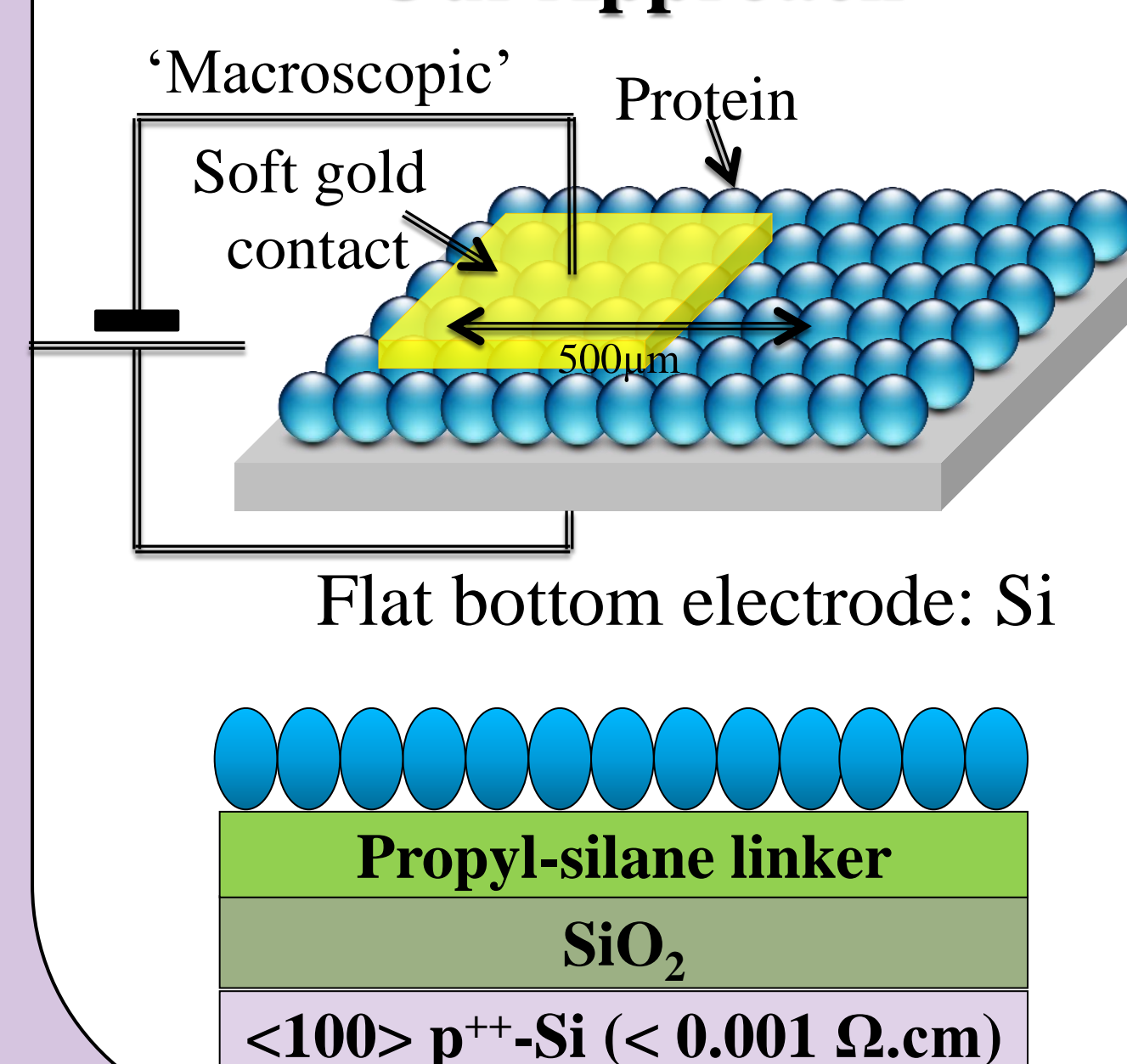


### Solution<sup>2</sup>



## Electrical Measurements (ETp)

### Our Approach



## Conclusions

- Surface-immobilized Cyt C is more stable than WT-Cyt C in solution.
- Thermal or Chemical denaturation affect the surface-immobilized Cyt C differently.
- Electrical transfer through Cyt C monolayer is significantly affected by denaturation while electrical transport is almost not affected.

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