PHOTOCURRENT GENERATED BY PHOTOSYNTHETIC REACTION CENTER/CARBON NANOTUBE/ITO BIO-NANOCOMPOSITE

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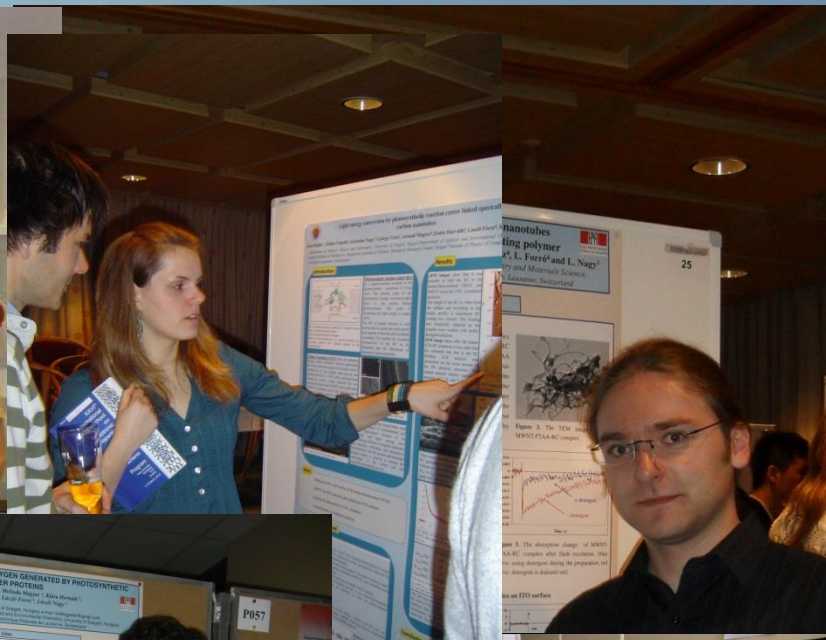
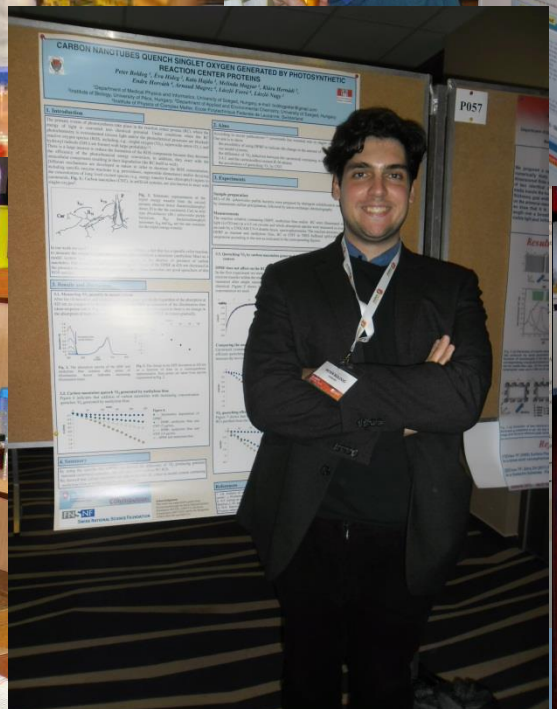
Bio-nanocomposite group



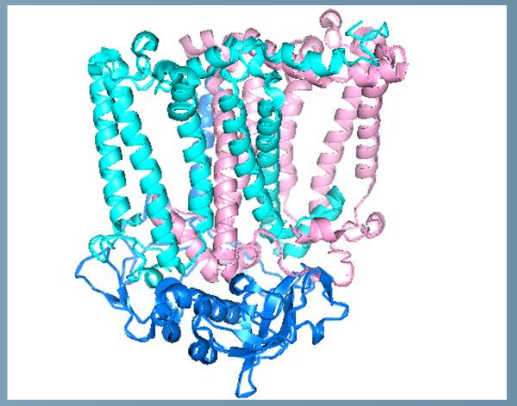


Introduction

- Hibrid materials
- Bio-nanocomposites
- Efficient strategies of living organism
- Photosynthetic reaction center protein (RC) - „natural solar cell”

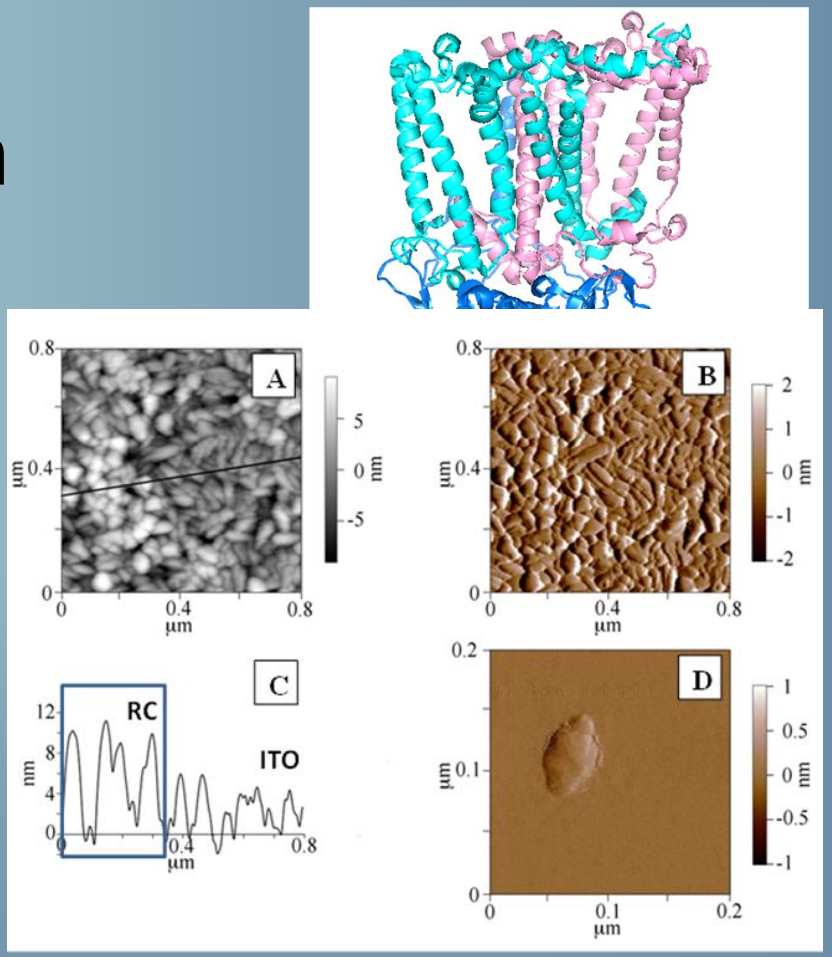
Structure of talk

- Reaction center protain



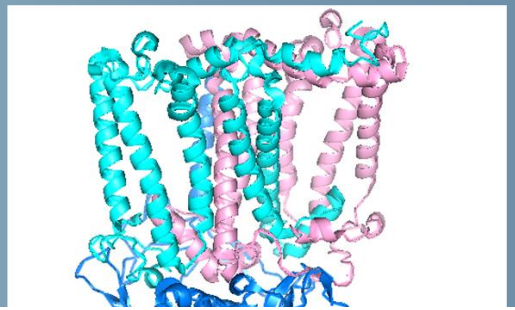
Structure of talk

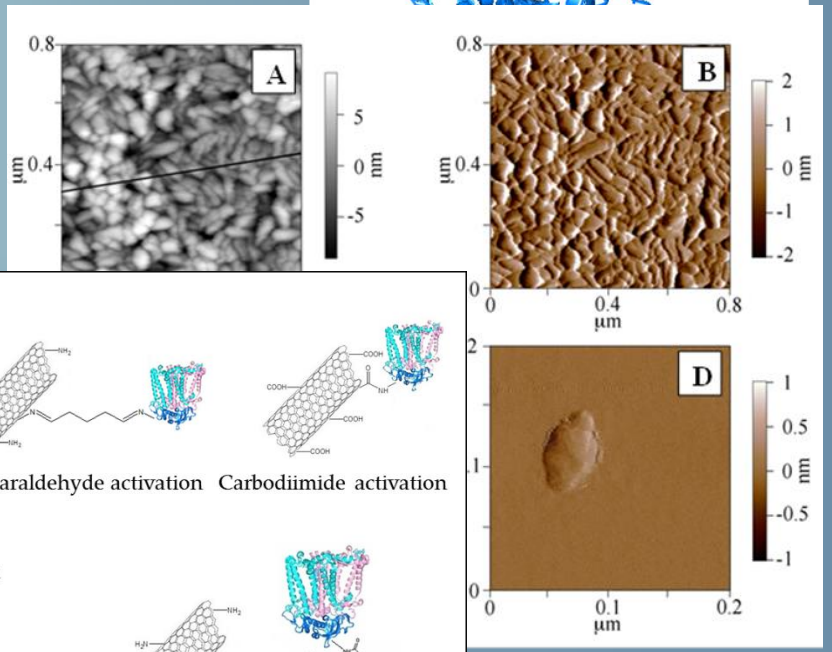
- Reaction center protain
- Dried samples

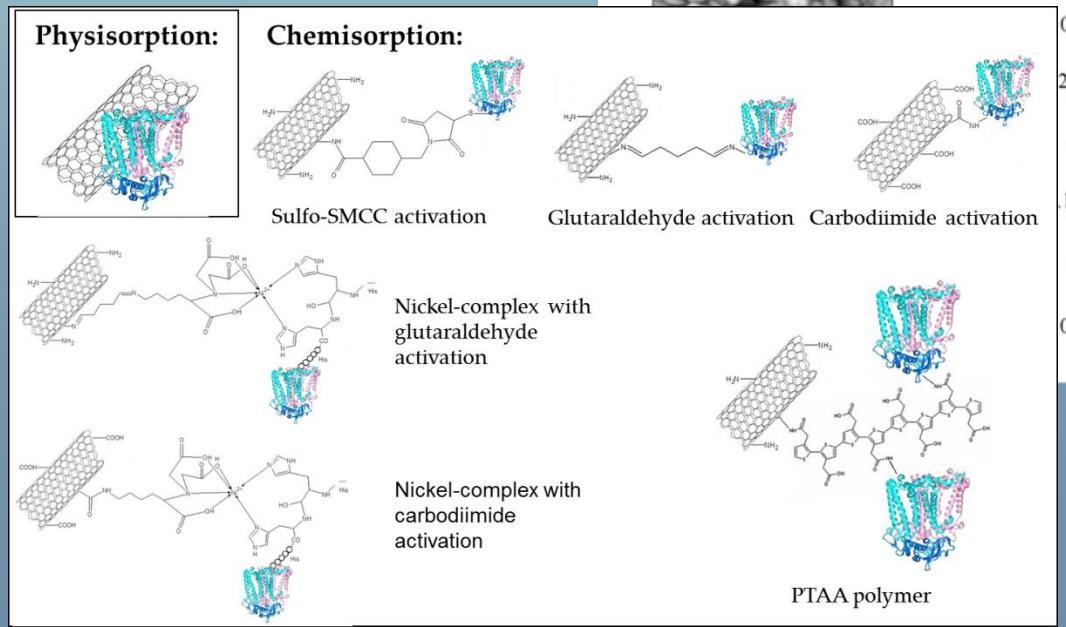


Structure of talk

- Reaction center protain
- Dried samples
- Binding strategies

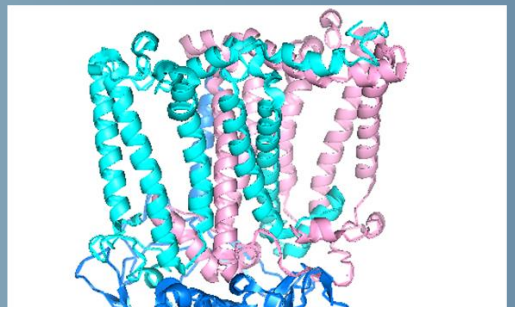


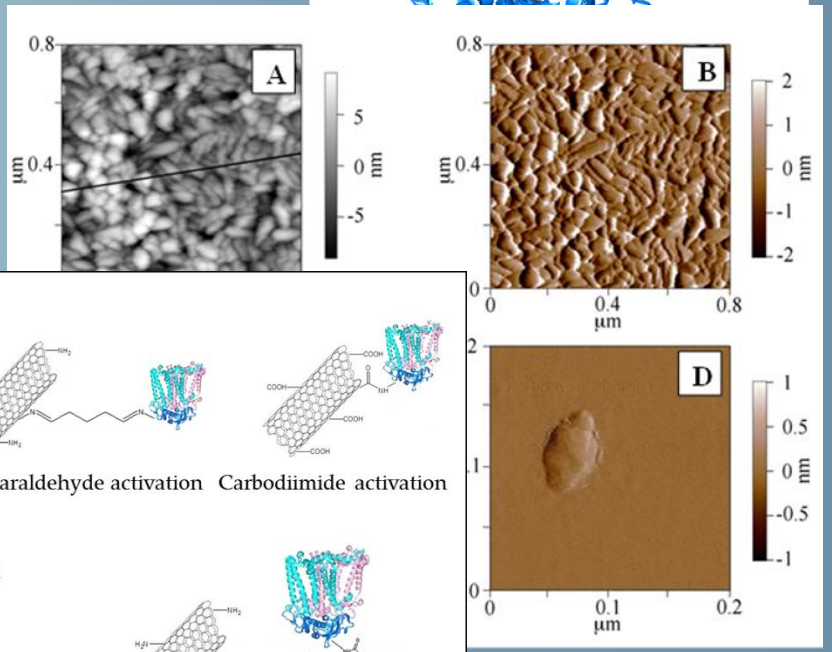


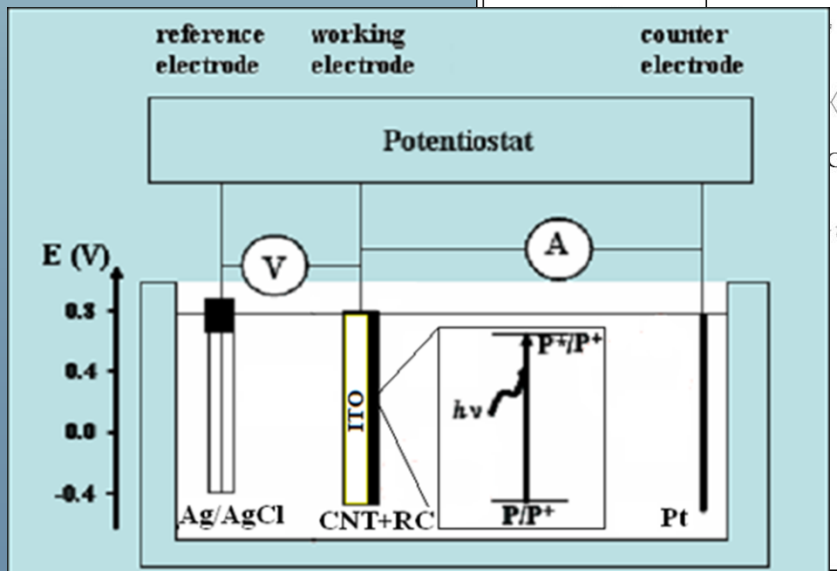


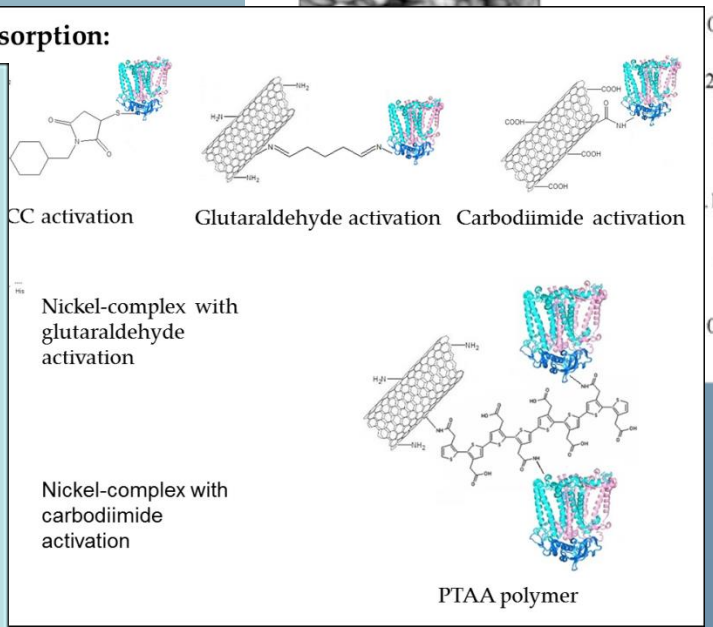
Structure of talk

- Reaction center protain
- Dried samples
- Binding strategies
- Elektrochemistry



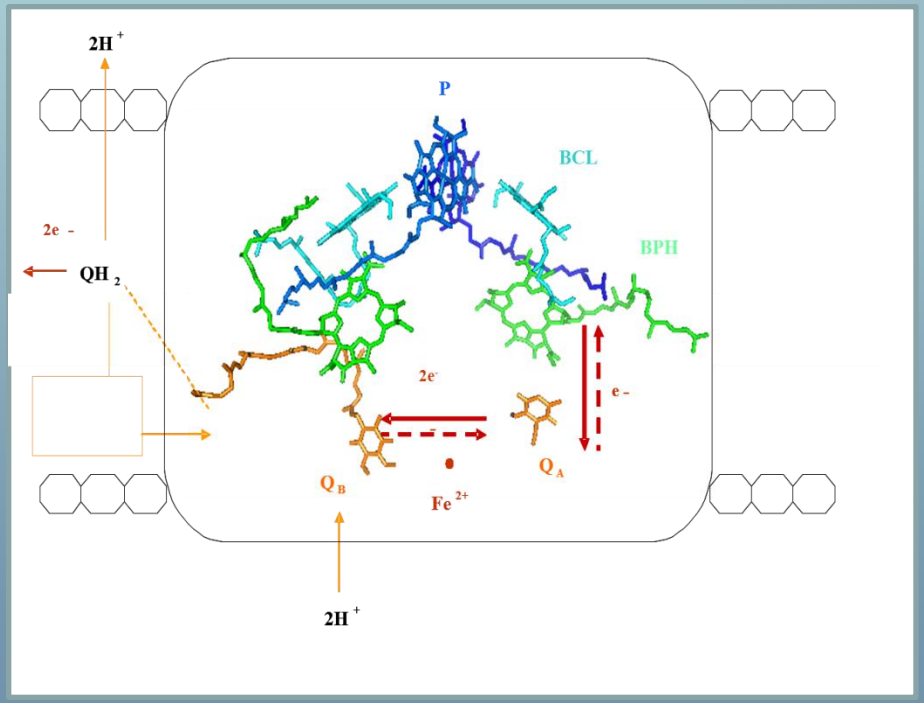


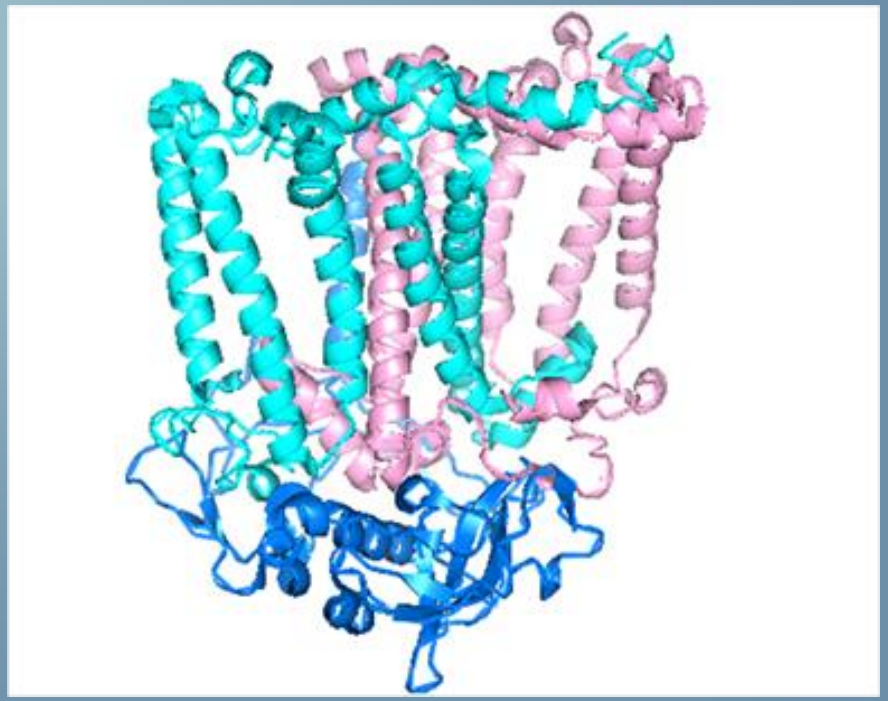




Light energy conversion in living organism

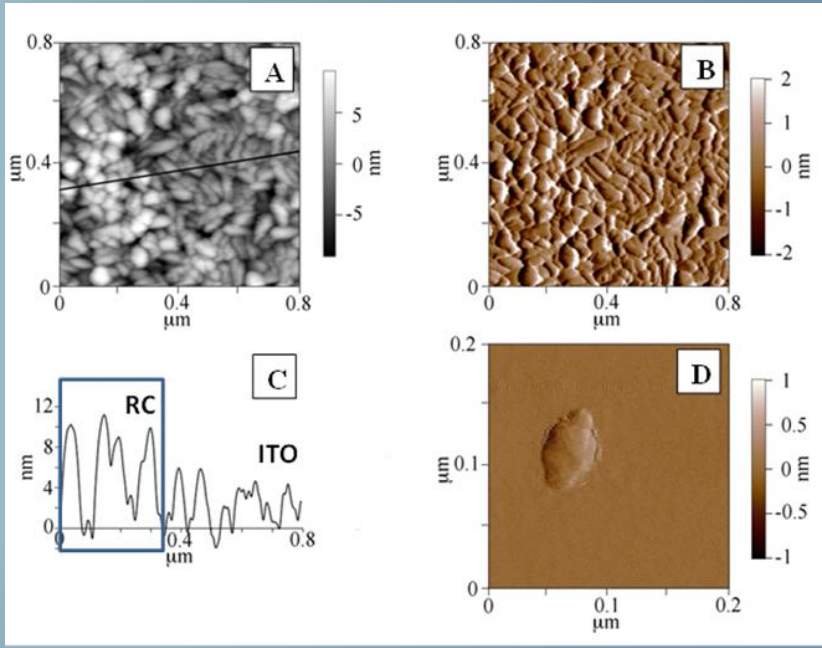
- Photosynthetic reaction center protein (RC) purified from *Rhodobacter sphaeroides* R-26

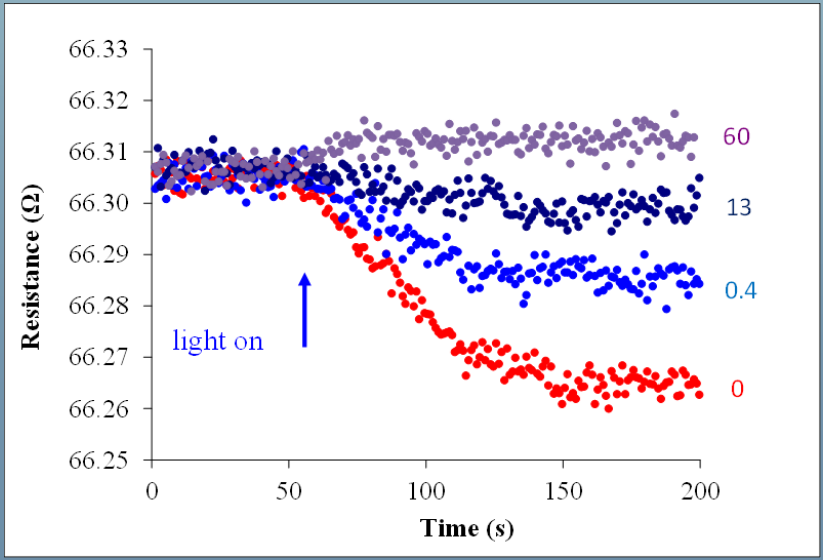


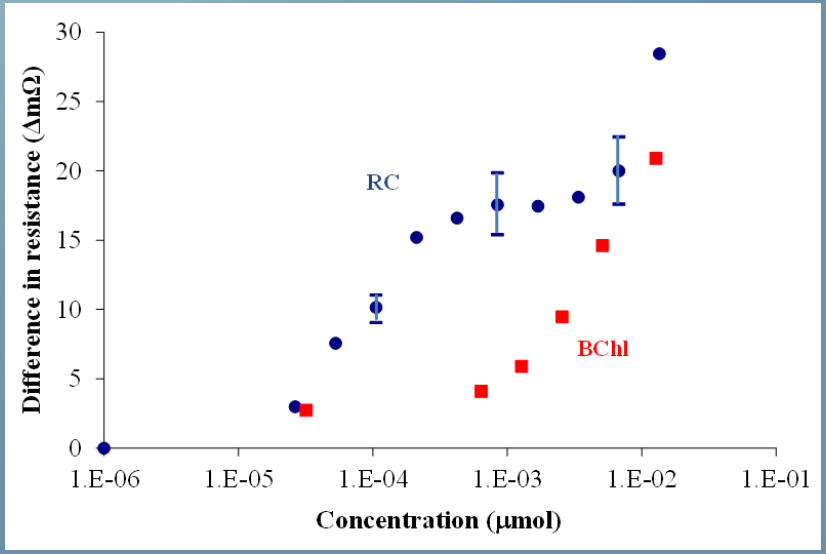


RC dried to ITO surface

- **Structural and resistivity measurements**

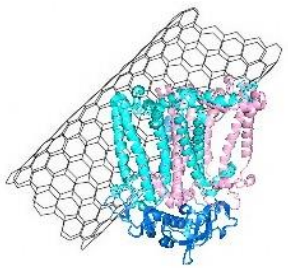




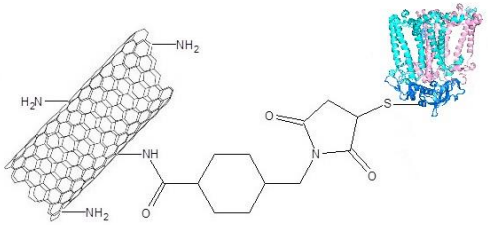


Summary of the CNT/RC binding procedures

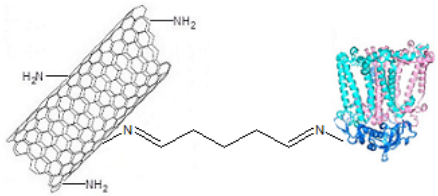
Physisorption:



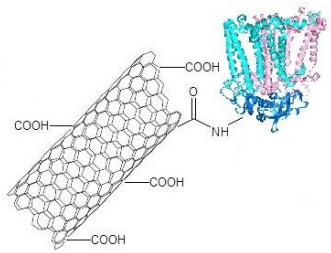
Chemisorption:



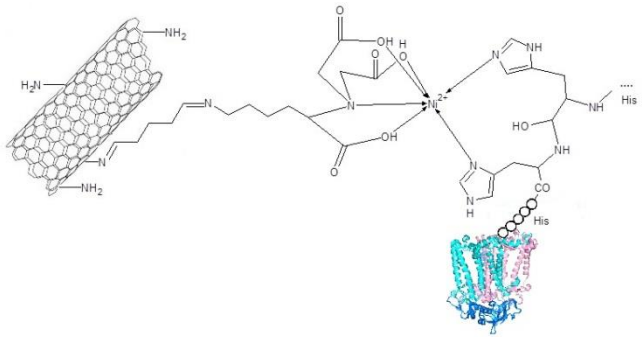
Sulfo-SMCC activation



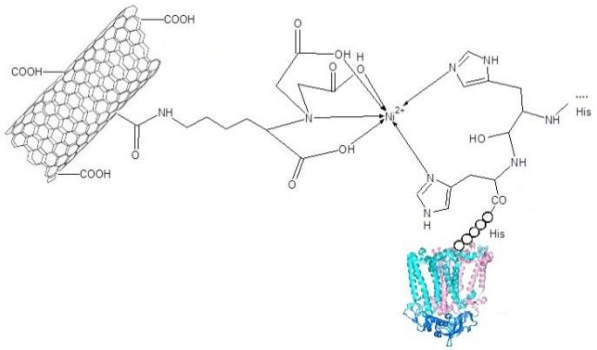
Glutaraldehyde activation



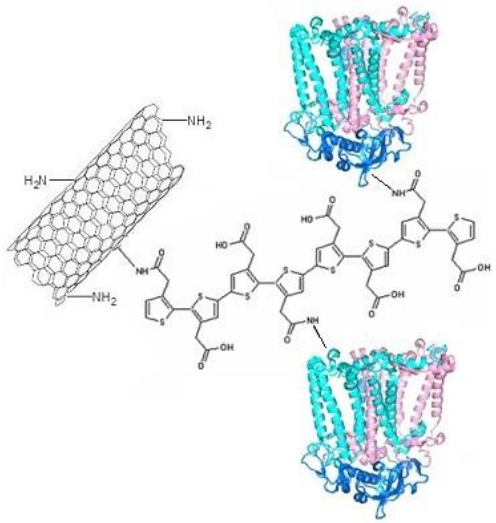
Carbodiimide activation



Nickel-complex with glutaraldehyde activation



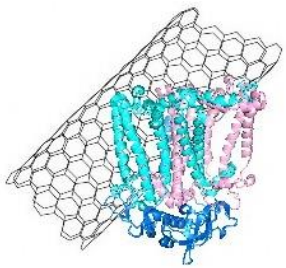
Nickel-complex with carbodiimide activation



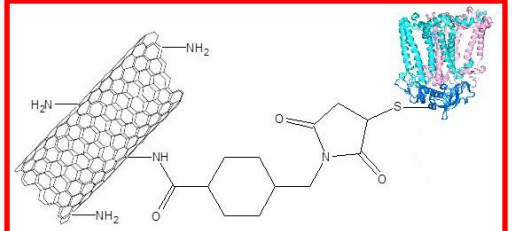
PTAA polymer

Summary of the CNT/RC binding procedures

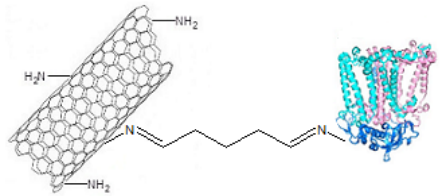
Physisorption:



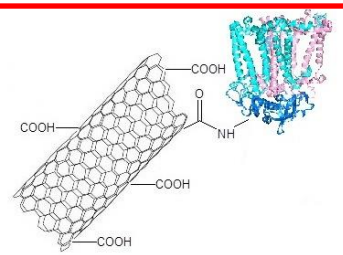
Chemisorption:



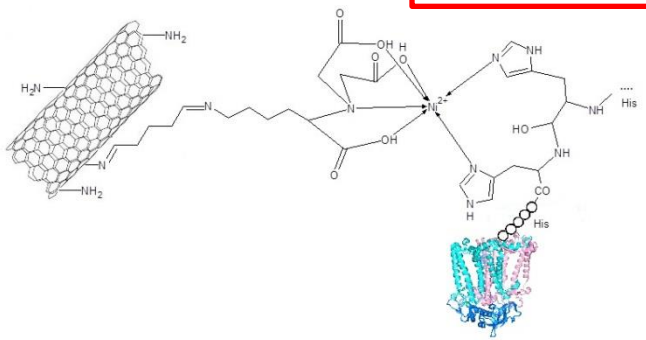
Sulfo-SMCC activation



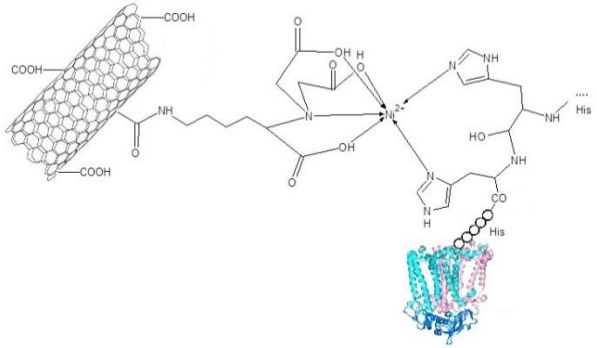
Glutaraldehyde activation



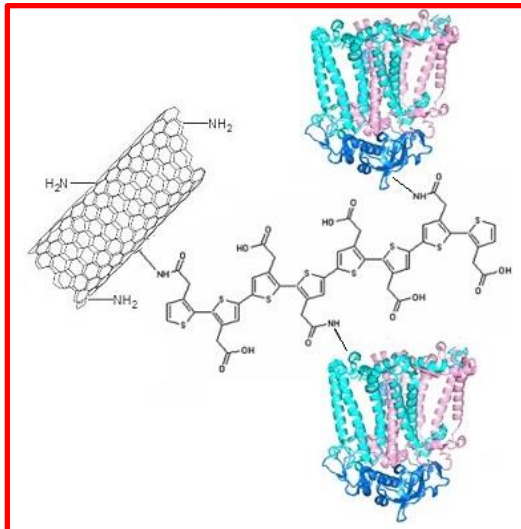
Carbodiimide activation



Nickel-complex with glutaraldehyde activation

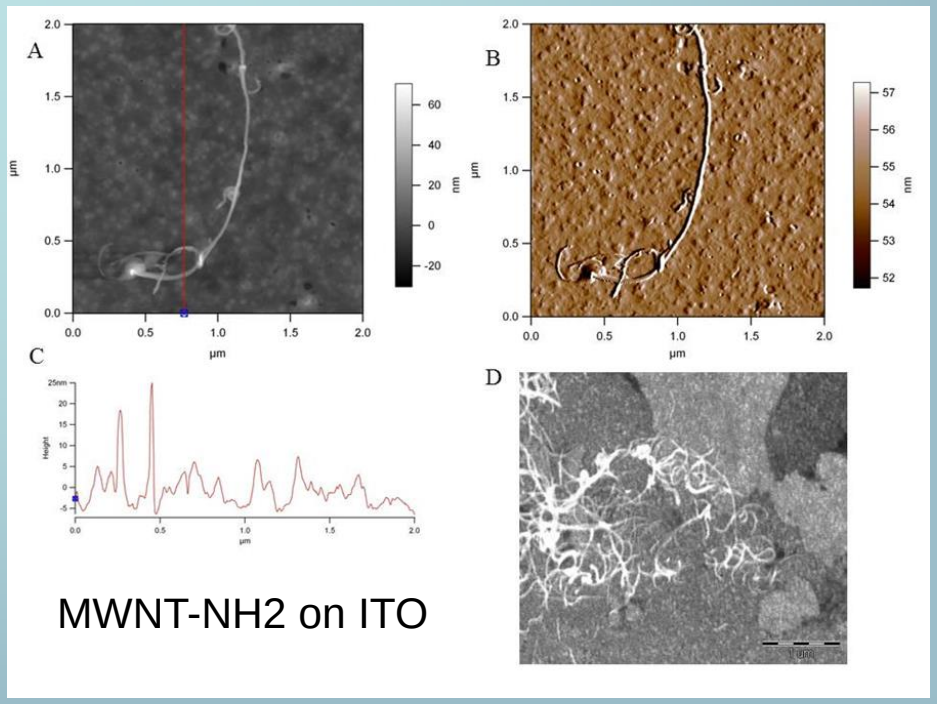


Nickel-complex with carbodiimide activation

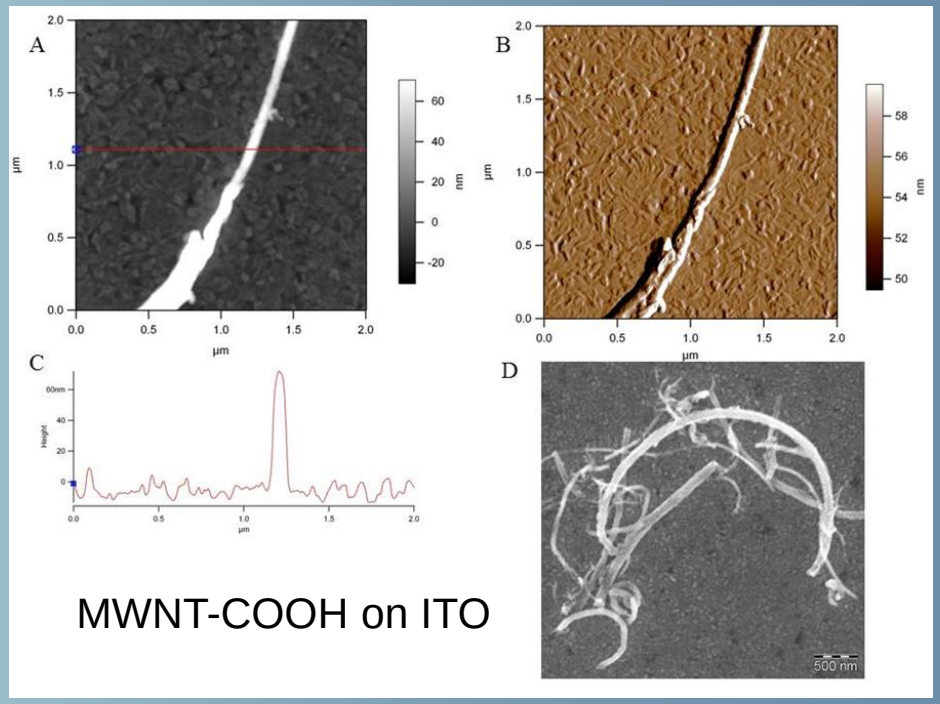


PTAA polymer

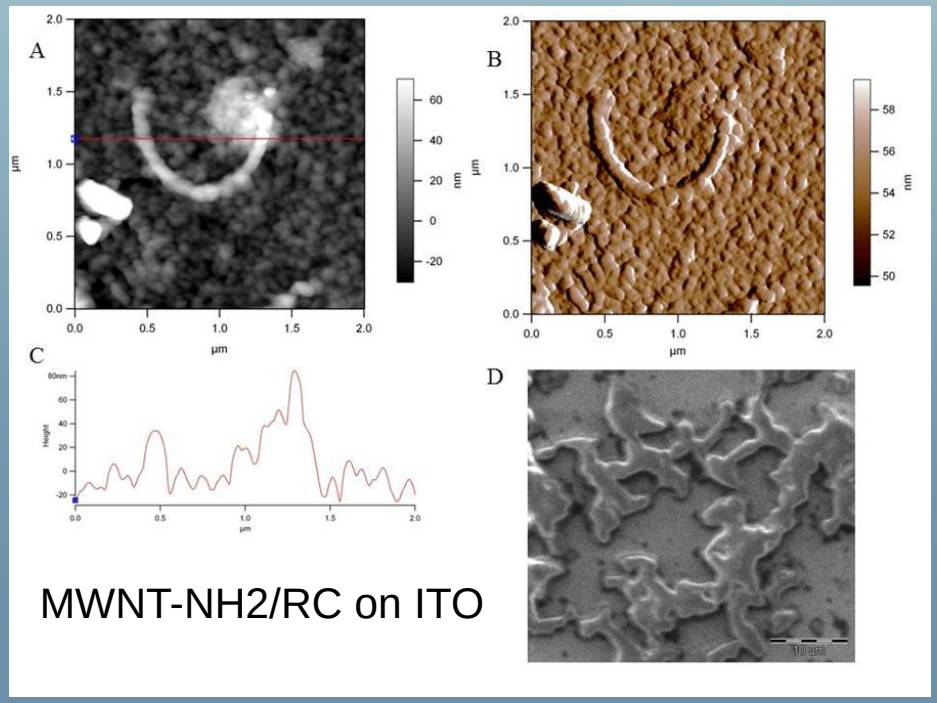
Structural measurements



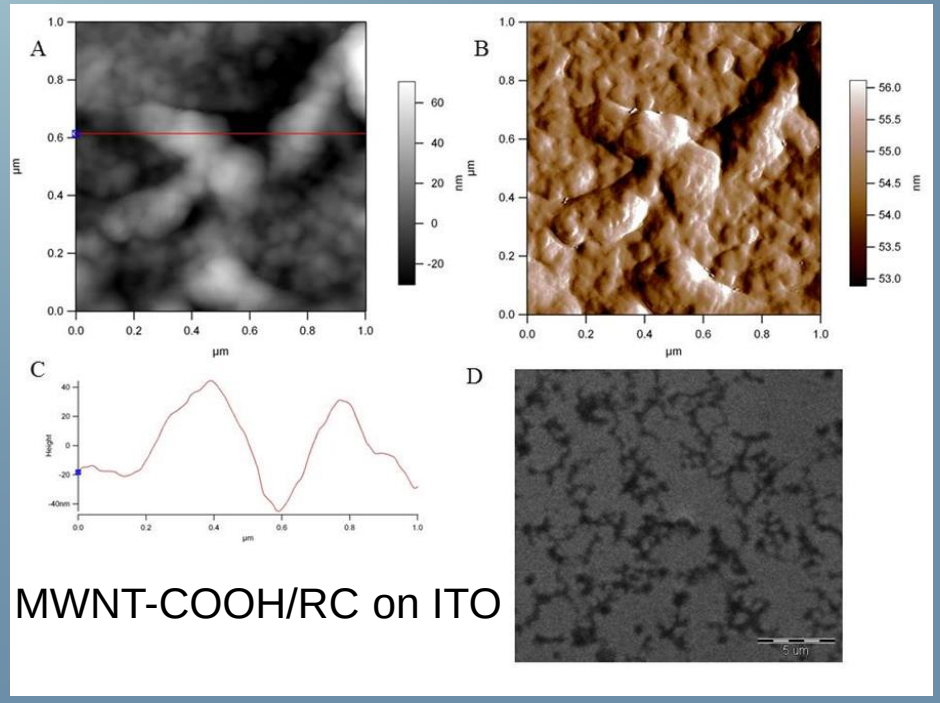
MWNT-NH2 on ITO



MWNT-COOH on ITO



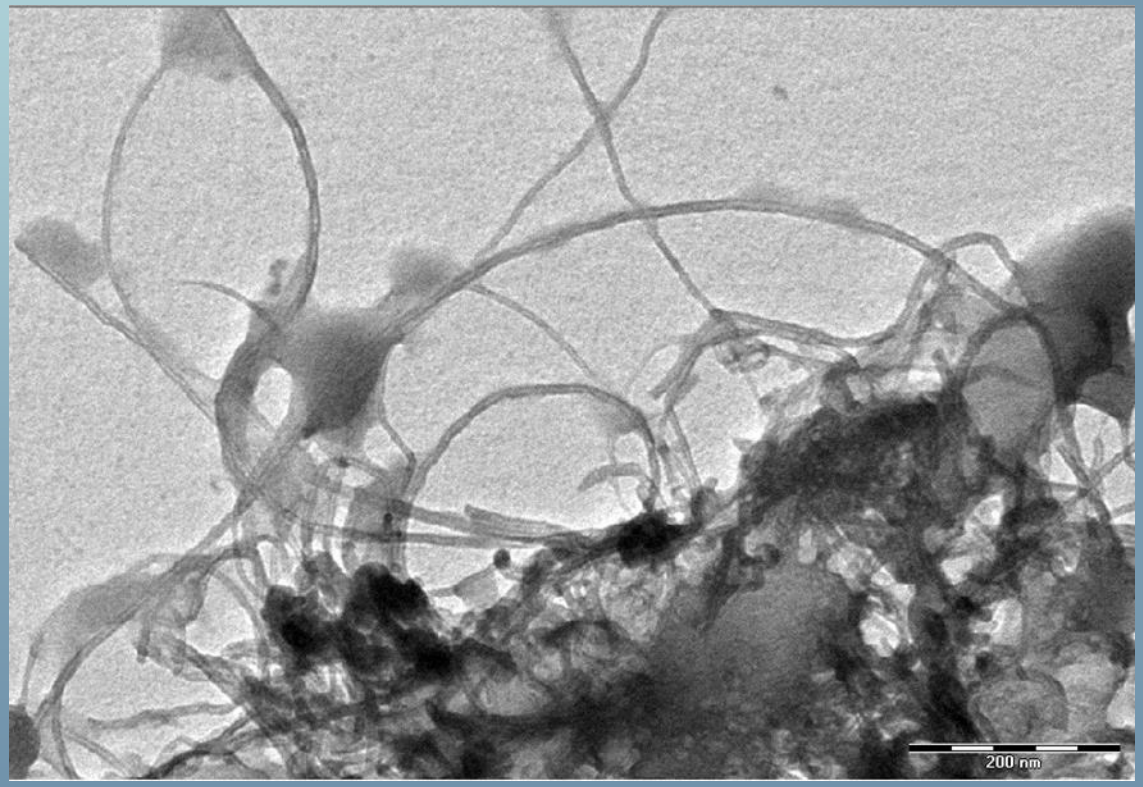
MWNT-NH2/RC on ITO



MWNT-COOH/RC on ITO

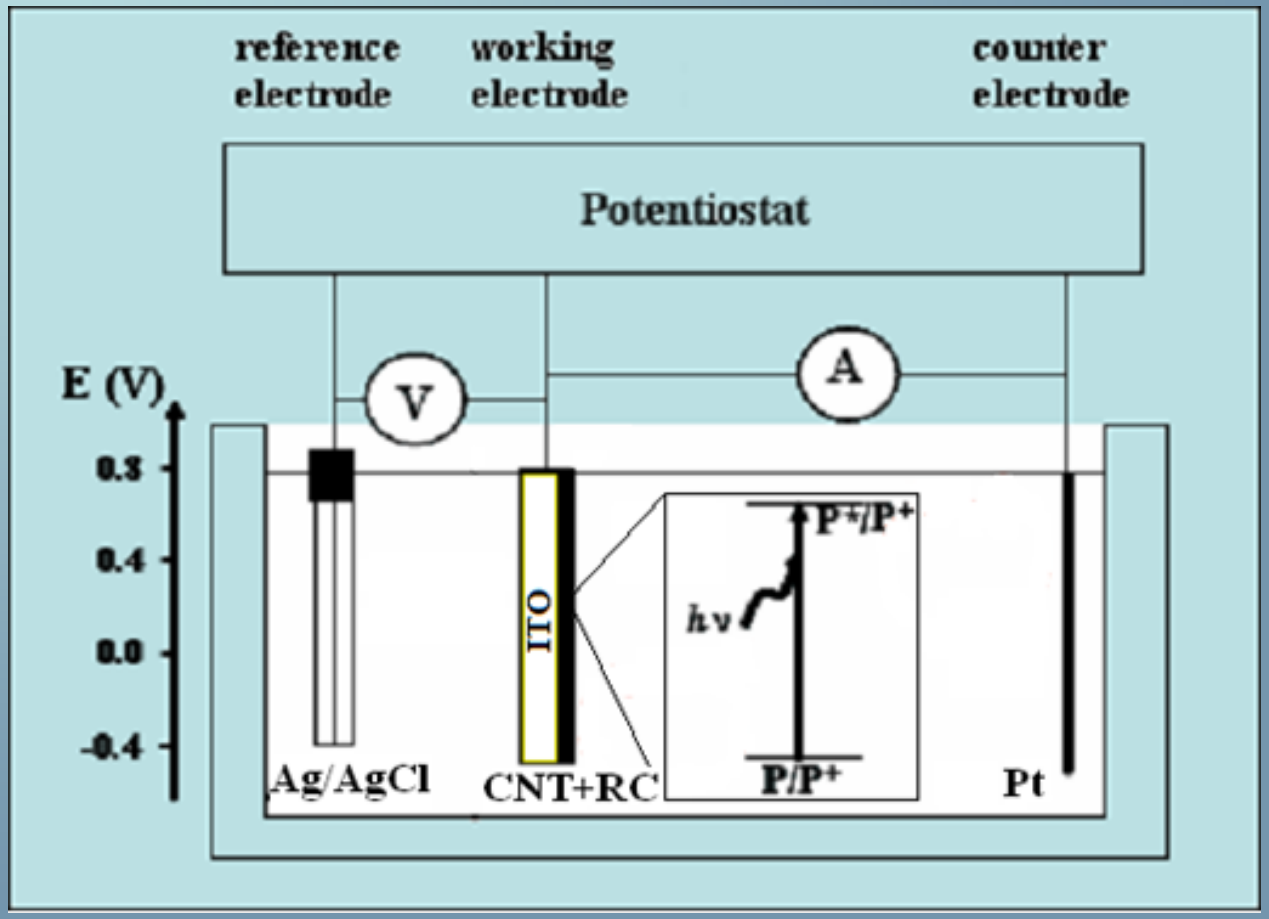
RCs bound by conducting polimer

- **Structural measurements (TEM)**

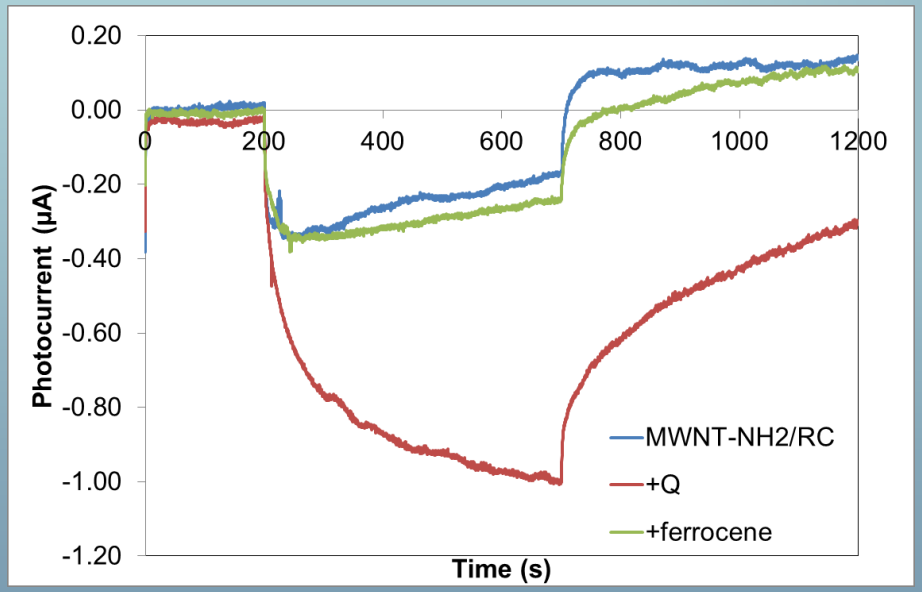


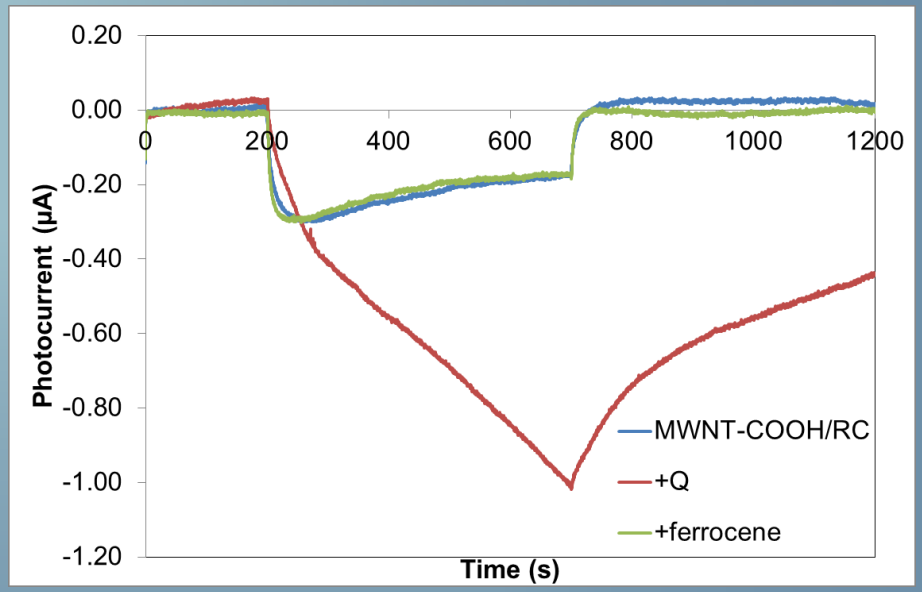
Electrochemical measurements

Electrochemical cell

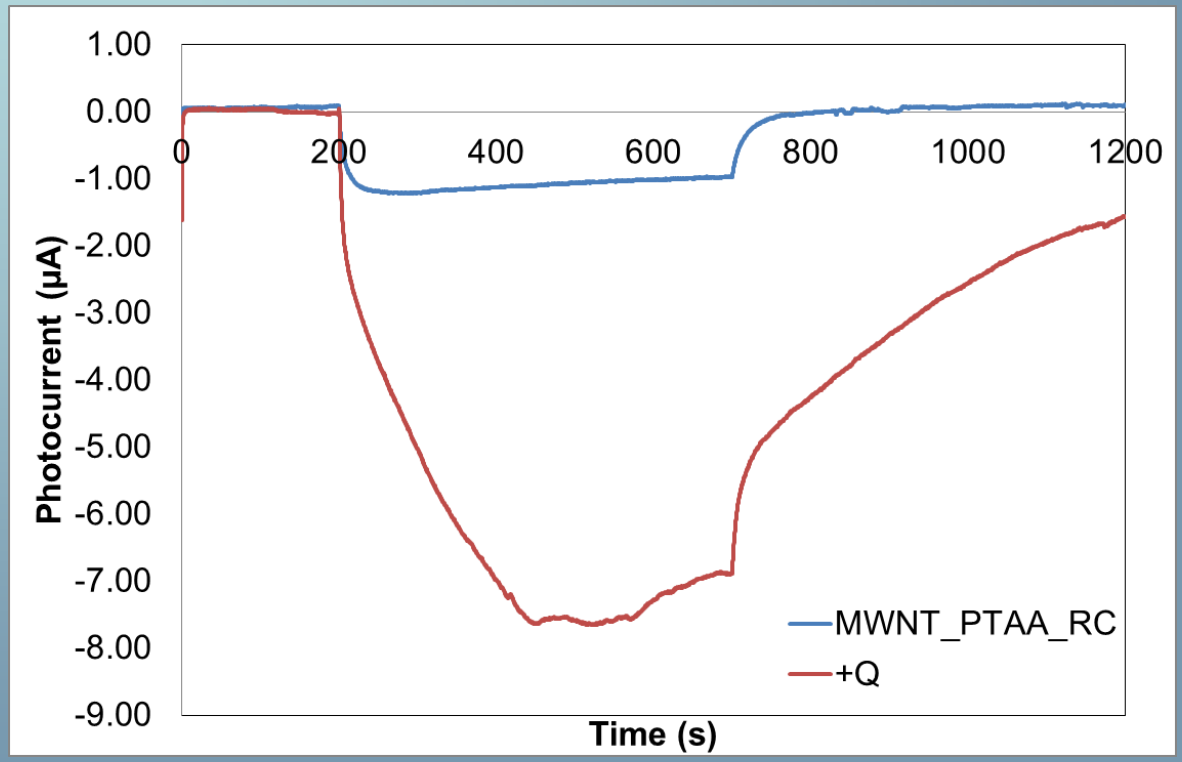


Ligth induced photocurrent in electrochemical cell





Ligth induced photocurrent in electrochemical cell



Summary

- We are able to fix RCs through MWNTs to ITO with different chemical binding methods.
- After the binding RC shows noticeable photoactivity in continuous turnover.
- UQ0 mediator increases the photocurrent.
- Both the amine and carboxy functionalized MWNTs showed considerable photoactivity.
- Using PTAA the photocurrent was even larger.

Further investigations

- Efficiency of the system
- Oriented binding
- Other redox mediators
- Spectroelectrochemical measurements
- Other transparent electrodes (CNT, graphene)

Contributors

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Thank you for your attention!