

RESEARCH EXPERIENCE IN NANOSCALE CARBON PIPETTE FUNCTIONALIZATION

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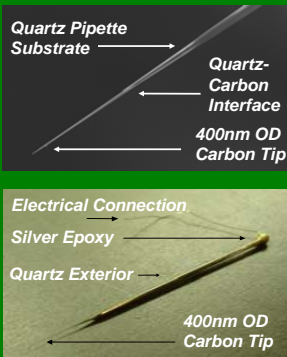
OBJECTIVE

High school(Physics,Math,Biology,
Chemistry),
Space Central School,SHAR
Indian Space Research Organization
B.Sc(Physics,Math,Electronics)
B.C.A(Computer Applications)
B.Ed(Bachelor of Education)
M.A(Child Care and Education)

Central High School
Physics Teacher for 11th grade

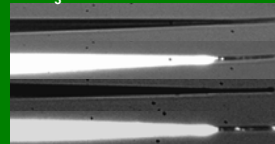
Nanoscale Carbon Pipette Functionalization

Purpose of Carbon Functionalization is to
(a) help deliver or remove material from a solution or cell.
(b) Electrical sensor for specific biomolecules.



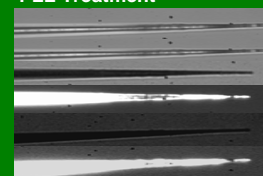
RESULTS

HNO₃ Treatment



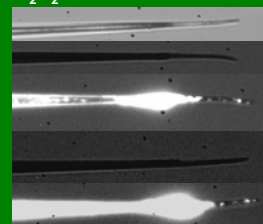
Without Fluorescence
With Fluorescence
Wash with PBS
Wash with PBS and with Fluorescence

PLL Treatment



Before Proteins
After Proteins
Without Fluorescence
With Fluorescence
Wash with PBS
Wash with PBS and with Fluorescence

H₂O₂ Treatment



Before Proteins
After Proteins and without Fluorescence
With Fluorescence
Wash with PBS
Wash with PBS and with Fluorescence

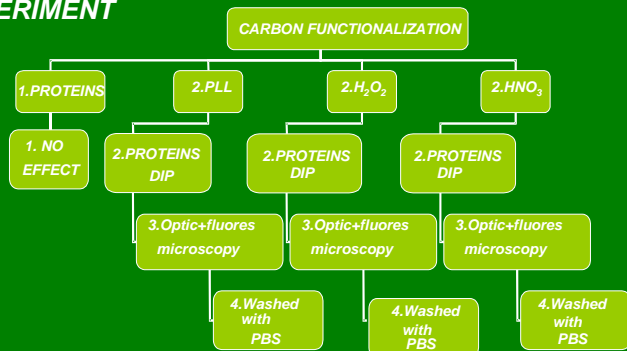
TABLE SHOWING PROBES DIPPED IN H₂O₂, PLL, AND HNO₃ FOR DIFFERENT DURATION

H2O2 Probes	PLL Probes	HNO3 Probes
1 hour 0410-0414	½ hour 0400-0406	15min 0422-0424 30min 0428-0429 60min 0433-0434 120 min 0437-0439
18 hours 0417-0418	20 hours 0408-0409	2 hours 0438-0439

CONCEPT MAP OF MY EXPERIMENT

STEPS INVOLVED IN PERFORMING THE EXPERIMENT

1. Proteins don't stick to untreated carbon probes.
2. Learnt to manufacture quartz pipettes, how to treat the carbon probes in HNO₃, H₂O₂, PLL for different durations. Then we dipped in proteins to see if they stick to carbon.
3. Observed the carbon probes using Optical and Fluorescence Microscopy to determine if the proteins were binding to carbon pipettes. Also searched literature on Carbon Nanotubes (CNT) and their properties and orientation. Compared differences between SWNT, MWNT and Amorphous Carbon pipe.
4. Compared protein binding to the Carbon pipettes under fluorescence microscopy after the carbon pipettes were washed in PBS for 30 minutes. Results were put in the hierarchical order of the proteins binding to the carbon pipettes



KNOWLEDGE IS POWER

Objects in the Universe range from the very small to the unimaginably large

- SI Units of Various Physical Quantities.
- Examples of Materials Showing Different Properties at the Nanoscale Level
- Carbon in the form of graphite (like pencil lead) is soft and malleable; at the nanoscale
- carbon can be stronger than steel and is six times lighter.
- Zinc oxide is usually white and opaque; at the nanoscale it becomes transparent.
- Aluminum - the material of soft drink cans - can spontaneously combust at the nanoscale and could be used in rocket fuel.
- Careers in Nanotechnology
- <http://www.nanotech-marketplace.com/nanotechjobs>

BASE QUANTITY	BASE UNIT	SYMBOL
LENGTH	METER	M
MASS	KILOGRAM	KG
TIME	SECOND	S

Prefix	Symbol	Scientific Notation
femto	f	10 ⁻¹⁵
pico	p	10 ⁻¹²
nano	n	10 ⁻⁹
kilo	k	10 ³
mega	M	10 ⁶
giga	G	10 ⁹

EXPERIMENTAL METHODS

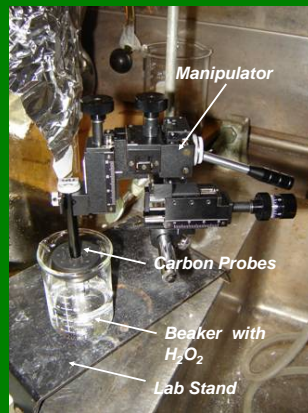
TESTING CARBON PIPETTES IN H₂O₂, PLL, AND HNO₃ AT LRSM UPENN TO MOTIVATE STUDENTS TO BE FUTURE ENGINEERS AND SCIENTISTS

Equipment

- Scanning Electron Microscopy
- Transmission Electron Microscopy
- Optical Microscope
- Fluorescent Microscopy
- Travel Drive (512MB)

Materials

- Carbon Pipettes
- 100ml Glass Beaker
- Distilled water & PBS
- H₂O₂ (50ml in 100ml beaker)
- PLL (10ml in 20ml Petri dish)
- HNO₃ (50ml in 100ml beaker)
- 10ml protein with 1ml PBS
- Alexa flour 488 IgG protein



CONCLUSION

Hierarchical order of proteins binding to carbon pipettes after fluorescence check:
(1) PLL (2) H₂O₂ (3) HNO₃

FUTURE WORK

We would like to treat four Carbon probes in each of the liquid solutions of PLL, H₂O₂, HNO₃ for 24 hours for future research.

ACKNOWLEDGEMENTS

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2. Michael G. Schrlau, PhD Candidate (My Mentor, UPenn)
3. Mr. James McGonigle (Program Coordinator, UPenn)
4. Ms. Holly Burnside (Program Coordinator, Drexel)

