**Input:**

CNT Nanostructure

1. Radius of CNTs
2. Length of CNTs
3. Gap Between CNTs
4. M-mm r
5. M-mm l
6. M-mm gap

Extraneous

1. Energy (Heat; I^2R)
2. Inches

Nano Structure Material Stack

1. Silicon Thickness
2. Silicon Dioxide Thickness
3. Silicon Dioxide Thickness 2
4. Metal 1 (Ti)
5. Alumina Thickness
6. Aluminum Thickness
7. Fe Thickness
8. M-mm Si
9. M-mm SiO2
10. M-mm SiO2 2
11. M-mm M1
12. M-mm Al2O3
13. M-mm Al
14. M-mm Fe

Nano Structure

1. Width of Base
2. Length of Base
3. M-mm WB
4. M-mm NS Base

Chip

1. Gap B/W NS
2. Width of Chip
3. Length of Chip
4. Gap n-m
5. M-nm WChip
6. M-nm LChip

Functionalization Molecule

1. Radius of Molecule
2. Length of Molecule
3. Gap Between Molecules
4. Dielectric of Molecule
5. M-mm r Molecule
6. M-mm L molecule
7. M-mm Gap Molecules

Analyte Molecule

1. Radius of Molecule Analyte
2. Length of Molecule Analyte
3. Gap Between Molecules Analyte
4. Dielectric of Molecule 2 Analyte
5. M-mm r Molecule Analyte
6. M-mm l Molecule Analyte
7. M-mm Gap Molecules Analyte

Cap/Cap Design

1. Energy Density WH/Lit
2. Er 2
3. Voltage
4. Frequency 2
5. Freq Hz K; M Hz

Potentiostat/Echem & Electrical Signals

1. Max V\_Out
2. Series Resistance of Solution
3. Frequency
4. Freq Hz-MHz

Electric Double Layer (EDL)

1. Co; millimolar (moles/m3)
2. Z
3. Er
4. T
5. V zeta
6. Co nM-M
7. V nV-m V-V

Charging/Discharging

1. Constant Current
2. Charging Voltage

**Output:**

Cap/Cap Design

1. Capacitance of 1 Pair NS
2. Energy
3. 1 NS Pair Energy / mass
4. 1 NS Pair Energy / volume
5. Impedance
6. Power
7. Chip energy / mass
8. Chip energy / volume
9. Chip Capacitance
10. Chip Energy
11. Chip Energy Wh
12. Wh/Kg
13. WH/m3
14. Chip Impedance
15. Chip Power
16. WH/Lit
17. Energy Density WH/m3
18. J in 1 NS pair with gap
19. Energy (wh/m3) / 1 NS pair with gap

Functionalization Molecule

1. Volume of Molecule
2. Area of Molecule on CNT surface
3. Molecule area with gap
4. Molecule length

Analyte Attached to Functionalized NanoStructure

1. Capacitance functional analyte per unit area
2. Capacitance per CNT analyte
3. Capacitance functional analyte per NS
4. Capacitance functional analyte per NS 2

Analyte Molecule

1. Volume of Molecule Analyte
2. Area of Molecule on CNT surface analyte
3. Molecule area with gap analyte
4. Molecule length analyte

Molecule Functionalization

1. Number of molecules on 1 CNT functionalized
2. Total functionalized molecules on NS
3. Concentration on 1 NS (moles/m3)
4. Concentration, M

Capacitance of Functional Molecule on NanoStructure

1. Capacitance Functional Molecule per unit area
2. Capacitance per CNT functional
3. Capacitance functional molecules per NS
4. Capacitance functional molecules per NS 2

Constants

1. E0; permittivity of free space
2. C; charge on e
3. F=eN\_A
4. K; Boltzmann Constant
5. N\_A; Avagadro No
6. R=kN\_A

EDL

1. C in M
2. C\_EDL/A
3. D; EDL Length
4. C EDL by d
5. C EDL by d with cosh factor
6. C\_EDL / 1 CNT
7. C\_EDL / 1 NS

Potentiostat/Echem & Electrical Signals

1. Rf for Max I; R+C (EDL+Funct)
2. Rf for Max I; R+C (EDL+Funct+Analyte)
3. Capacitance of ELD & Functionalization
4. Impedance of EDL & Functionalization
5. Capacitance of ELD & Functionalization Analyte
6. Impedance of EDL & Functionalization Analyte
7. Total Impedance Rs +C (EDS + Funct)
8. Total Impedance Rs + C (EDS + Funct + Analyte)
9. Delta Total Impedance
10. Delta C
11. |Z| of R + C (EDL + Funct)
12. |Z| of R + C (EDL + Funct + Analyte)
13. V\_Zeta
14. Max I; R + C (EDL + Funct)
15. Max I; R+C (EDL+Funct+Analyte)
16. Delta i

Mass and Volume of Chip

1. Volume of a chip
2. Mass of a chip

Mass and Volume of NS Pair

1. Volume 1 NS
2. Volume 2 NS
3. Volume NS Pair with Gap
4. Mass 1 NS
5. Mass 2 NS
6. Mass NS Pair with Gap
7. Volume Gap
8. Mass Gap

Gap B/W NS Material

1. Silicon Thickness Gap
2. SiO2 Thickness Gap
3. Dielectric Thickness Gap
4. Volume Si Gap
5. Volume SiO2 Gap
6. Volume Dielectric Gap
7. Mass Si Gap
8. Mass SiO2 Gap
9. Mass Dielectric Gap
10. Delta Temp Change Si Gap
11. Delta Temp Change SiO2 Gap
12. Delta Temp Change Dielectric Gap

NanoStructure Material Stack

1. CNT Thickness (CNT Length)
2. Dielectric Thickness
3. M-mm CNT
4. M-mm Dielectric
5. Silicon thickness 2
6. SiO2 Thickness
7. SiO2 Thickness 2
8. M1 Thickness
9. Al2O3 Thickness
10. Al Thickness
11. Fe Thickness 2
12. CNT Thickness
13. Dielectric Thickness 2
14. Volume Si
15. Volume SiO2
16. Volume SiO2 2
17. Volume M1
18. Volume Al2O3
19. Volume Al
20. Volume Fe
21. Volume CNT
22. Volume Dielectric
23. Mass Si **START HERE**
24. Mass SiO2
25. Mass SiO2 2
26. Mass M1
27. Mass Al2O3
28. Mass Al
29. Mass Fe
30. Mass CNTs
31. Mass Dielectric
32. Delta Temp Change Si
33. Delta Temp Change SiO2
34. Delta Temp Change SIO2 2
35. Delta Temp Change M1
36. Delta Temp Change Al2O3
37. Delta Temp Change Al
38. Delta Temp Change Fe
39. Delta Temp Change CNT
40. Delta Temp Change Dielectric

Extraneous

1. Heat Generated (Energy) by current in metal films
2. Um in 1 inch
3. microns

Chip

1. Area B/W NS
2. Gap B/W NS
3. No of NS Pairs on Chip

Nanostructure

1. Ns Width
2. Ns Length
3. Ns Base Area
4. Surface Area 1 NS
5. # of CNTs in 1 NS

CNT Nanostructure

1. Length of CNTs 2
2. CNT radius
3. CNT base area
4. Surface area of 1 CNT
5. Area 1 cnt & gap

Constants for Materials in Stack

1. Silicon density
2. SiO2 density
3. SiO2 2 density
4. M1 density
5. Al2O3 density
6. Al Density
7. Fe Density
8. CNT Density
9. Dielectric density
10. Silicon specific heat capacity
11. Sio2 specific heat capacity
12. Sio2 specific heat capacity 2
13. M1 specific heat capacity
14. Al2O3 specific heat capacity
15. Al specific heat capacity
16. Fe specific heat capacity
17. CNT specific heat capacity
18. Dielectric specific heat capacity

Charging/Discharging

1. Charging Time
2. Dissipated Power Loss
3. Energy dissipated
4. Total Temperature change