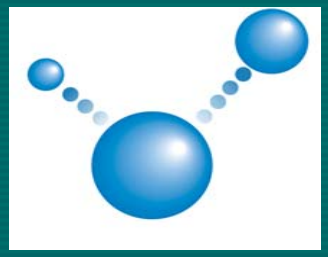


Green Energy & Molecular Engineering Lab

(A-Group)

Bio-Photonics & Intelligent Vehicle Lab

(E, F-Groups)

Prof. Che-Wun Hong (洪哲文教授）

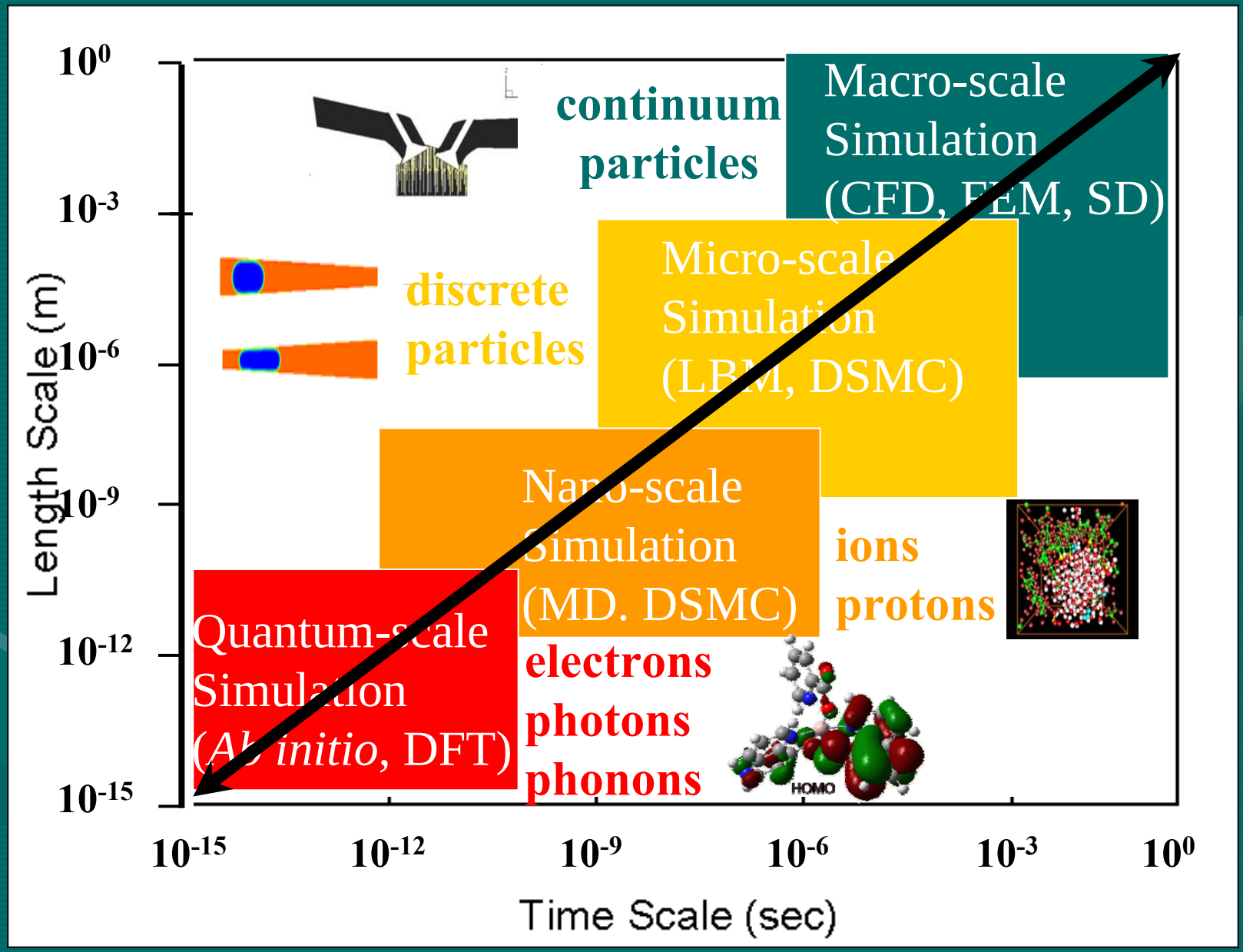
Department of Power Mechanical Engineering

National Tsing Hua University

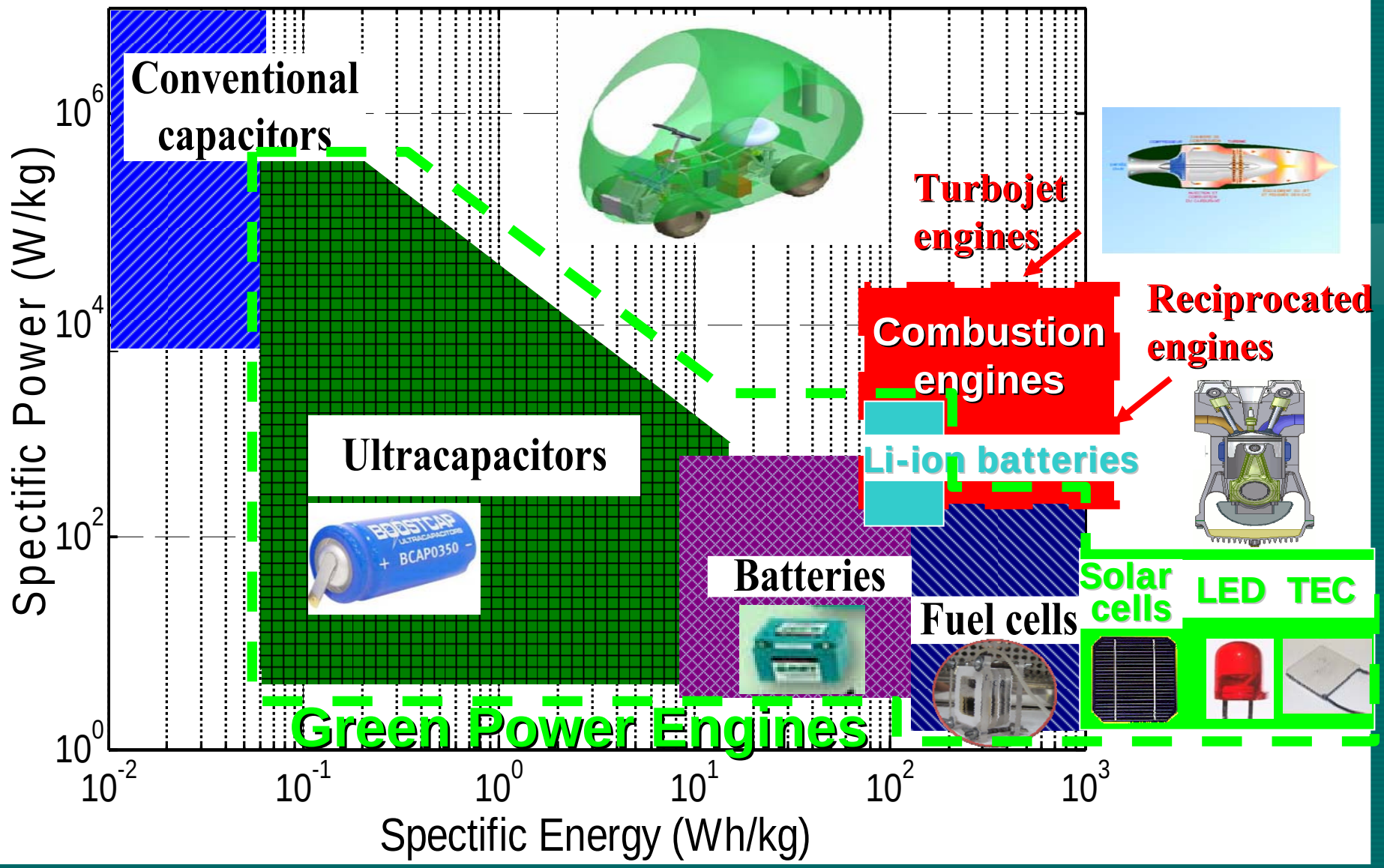
Academics: Quantum Mechanics, Molecular Dynamics, Lattice Boltzmann Dynamics, Computational Fluid Dynamics, System Dynamics, Dynamic System Control

Research : Fuel Cells, Li Batteries, Super-Capacitors, Thermo-Electric Chips, Quantum-Electrochemical Solar Cells, Organic LEDs, Combustion Engines, Turbochargers, Hybrid Electric Vehicles, Automotive Engineering

Academic Fundamentals



Research Area

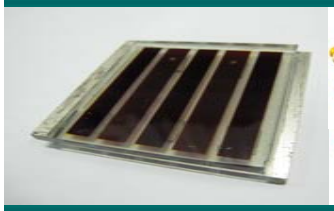
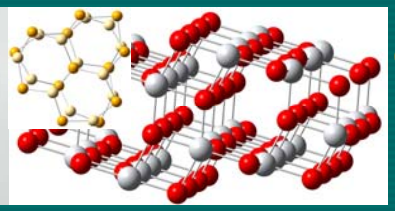


Green Energy & Molecular Engineering Lab

Objective: Direct energy conversion without pollution

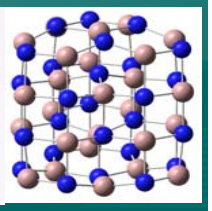
Approach: Multi-scale simulation and design of green power engines from Quantum to Nano to Micro to Meso to Macro- Scales

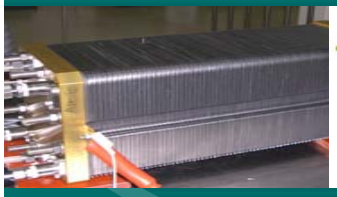
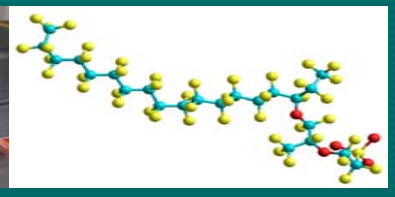
Research Area:

QD Solar Cell←→QD LED

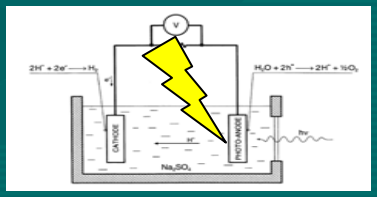
Photon ←→ Electron

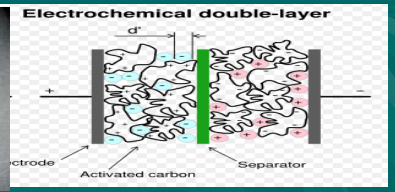



Fuel Cell ←→Electrolysis

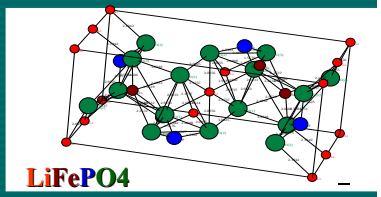
Proton ←→ Electron

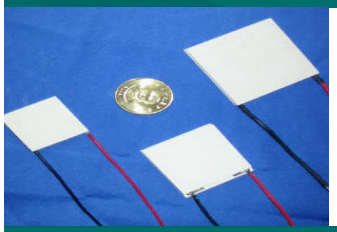
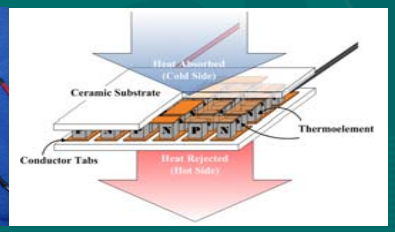


Super-caps + Li Batteries

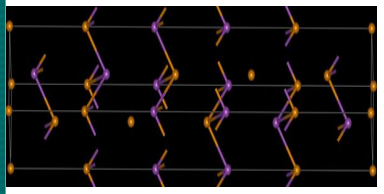
Ion ←→ Electron



Thermoelectric Chips

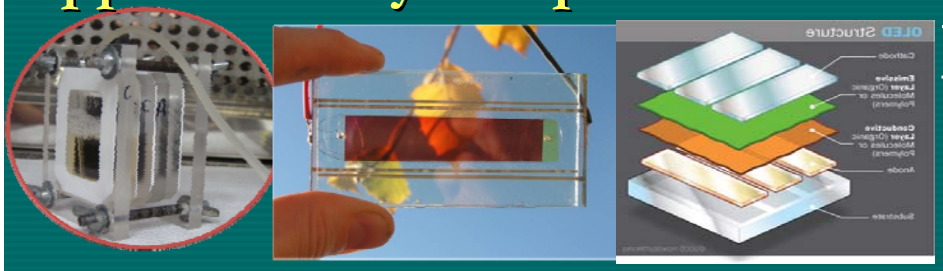
Phonon ←→ Electron



Bio-Photonics & Intelligent Vehicle Lab

Objective: Green power vehicle design and intelligent control

Approach: Key component → Device → System → Intelligent Control



Research Area:

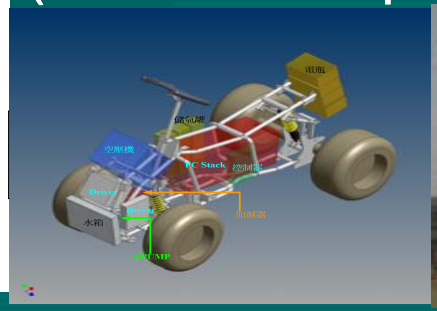
Bio-Fuel Cells + Bio-Solar Cells
+ Organic Light Emitting Diodes

Cabin Air Conditioner (Solar Cells + Heat Pipes + Semiconductor Cooling Chips)

Plug-in Hybrid Electric Vehicle Design
(Engine + Motor + Li-ion Battery + CVT)

Photo 1: Hybrid Electric Scooter

Personal Mobility Electric Vehicle
(Fuel Cell + Supercapacitors+ Battery)

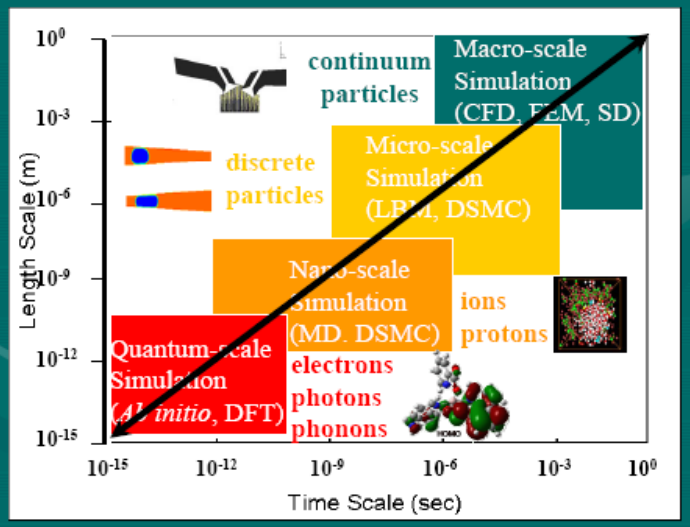


Next Generation Green Power Engineering

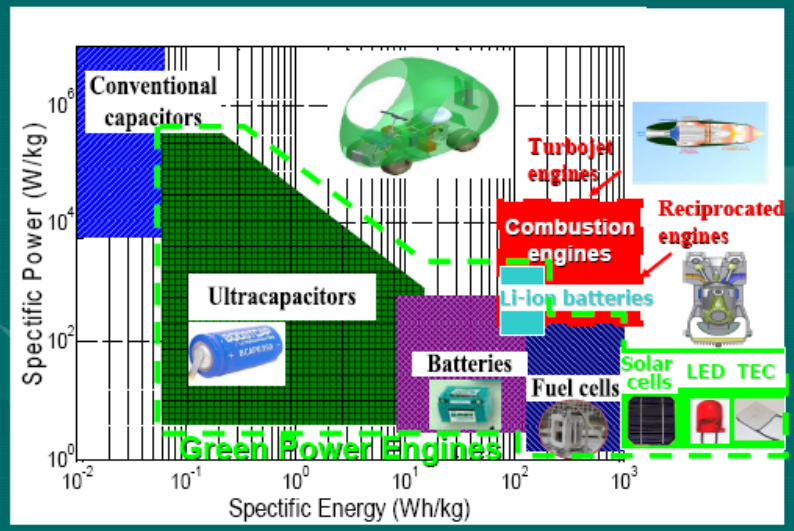
Multi-scale Analysis and Design of Green Energy Engineering

多尺度綠能工程研究

Academic Fundamentals



Research Area

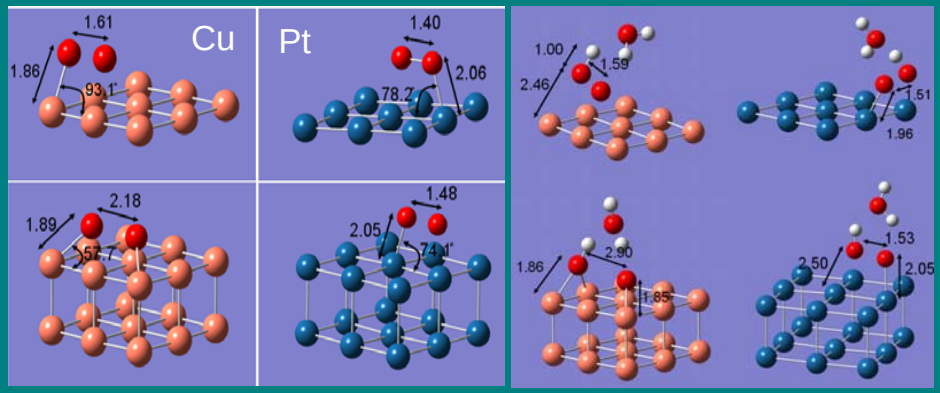


Catalytic Reduction in Low Temperature Fuel Cells

◆Oxygen Reduction Mechanism on Pt and Cu Catalyst Clusters

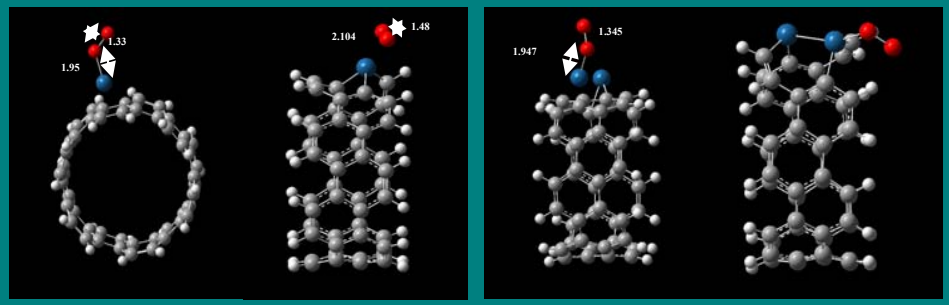
Oxygen Adsorption

First Proton Transfer



◆Oxygen Reduction Mechanism on Carbon Nano Tubes (CNTs)

O_2 Adsorption on Pt-absorbed and Pt-doped CNTs

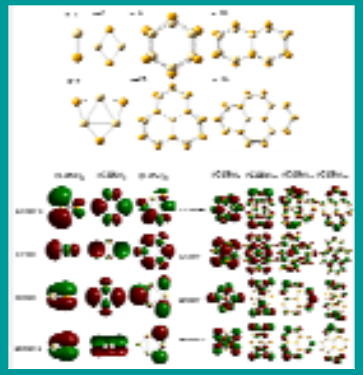


First-Principles Computational Quantum Mechanics
第一原理-計算量子力學

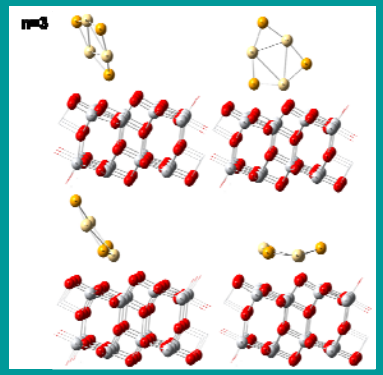
Photoelectrochemical Solar Cells and BioSC

◆Photonic Characteristics of Quantum Dots on TiO2

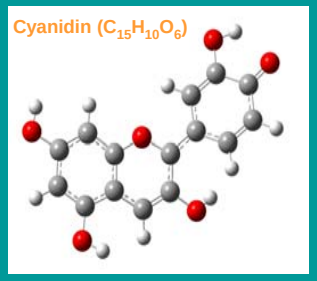
$(CdSe)_n$ Molecular Orbitals

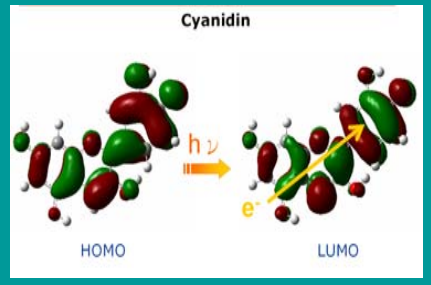


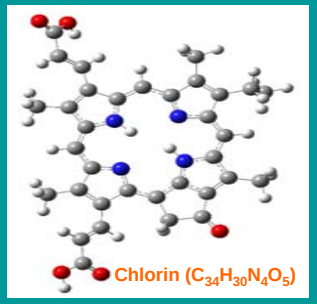
$(CdSe)_n$ Absorption on TiO_2

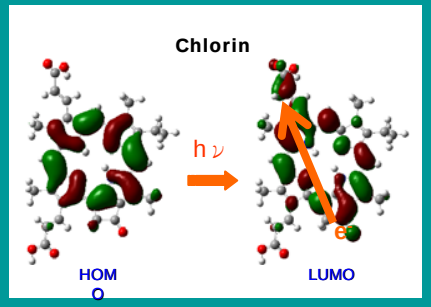


◆Photonic Characteristic of Biologic Pigments





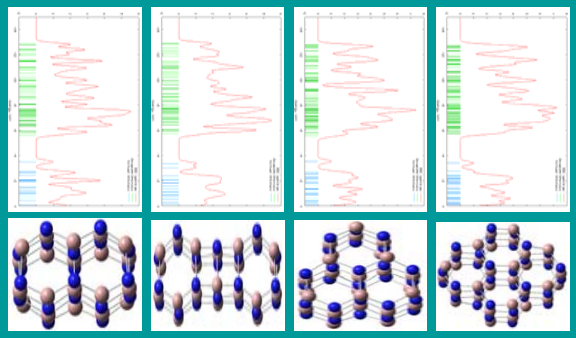


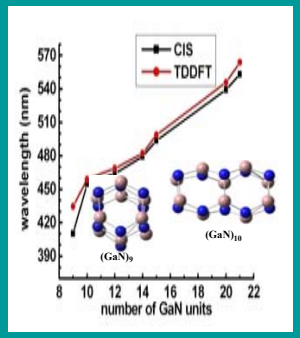


Light Emitting Diodes (LEDs) and OLEDs

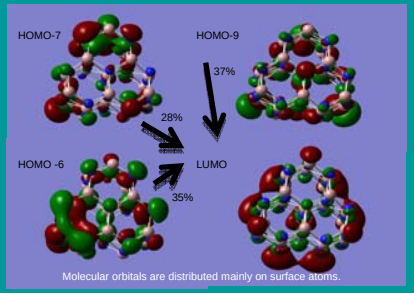
◆GaN Cluster Photonic Characteristics

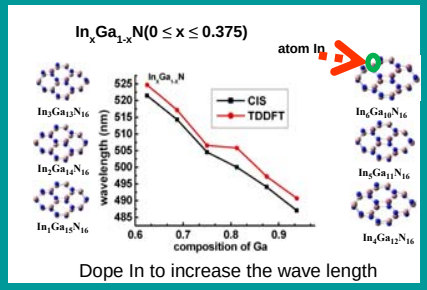
Density of States (DOS)





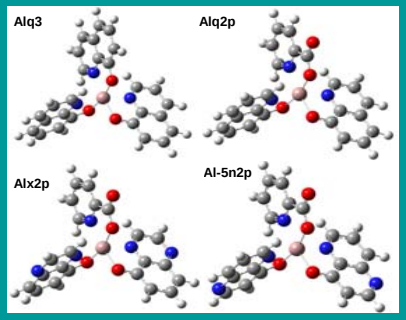
Wave length diagram

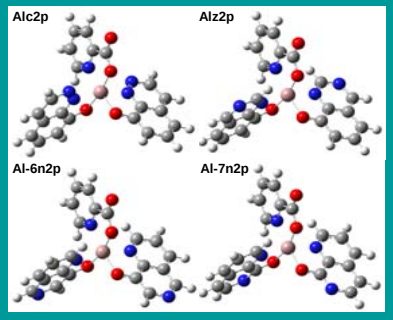




Dope In to increase the wave length

◆OLED Photonic Characteristic

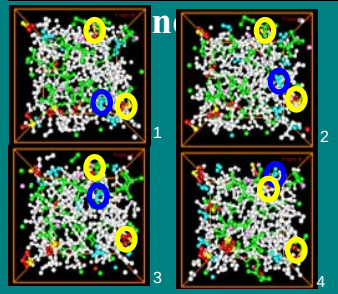


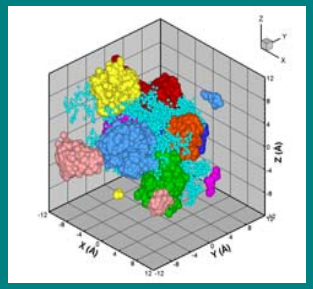


Molecular Dynamics and Computational Fluid Dynamic

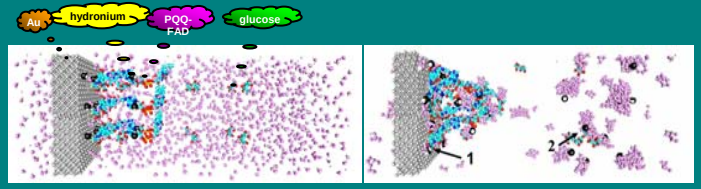
分子動力與計算熱流

Proton Exchange through Nafion

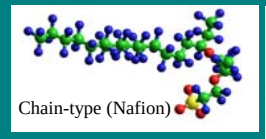


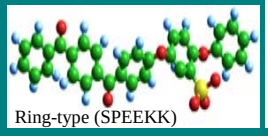


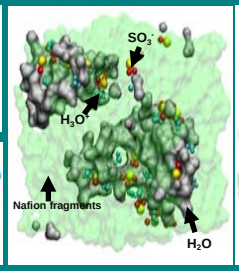
Membraneless Enzymatic Biofuel Cell

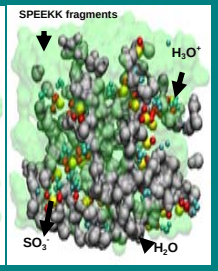


Methanol Crossover via DMFC Membrane

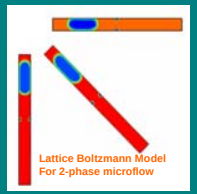


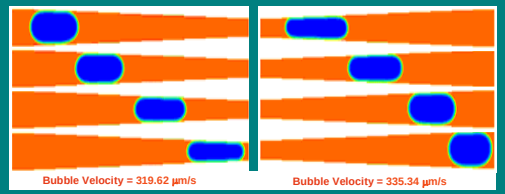




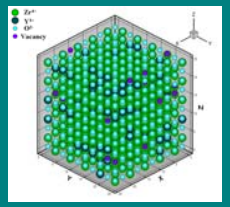


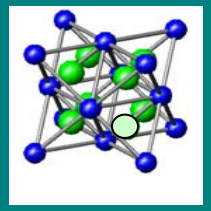
Bubble Removal at DMFC Anode (TLBM)



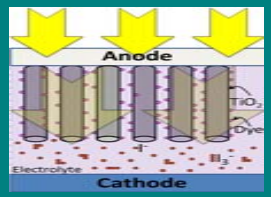


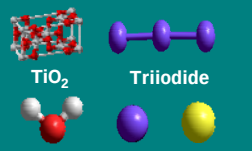
Oxygen Ionic Dynamics in SOFC

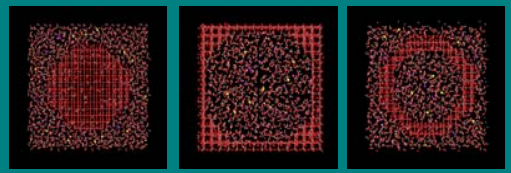




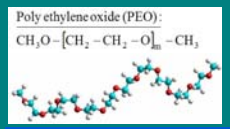
Photoelectrochemical Solar Cells

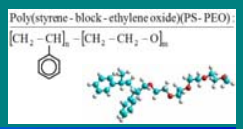






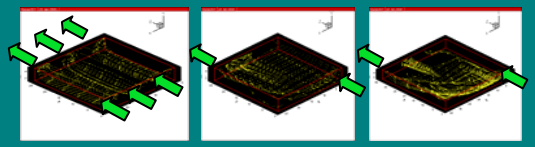
Interaction between Electrolyte and Anode in Li-ion Batteries



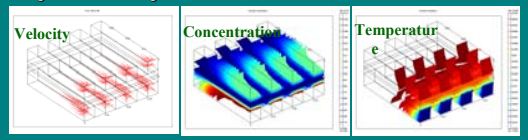


Fuel Cell Single Cell Design

Diffusion Layer Design

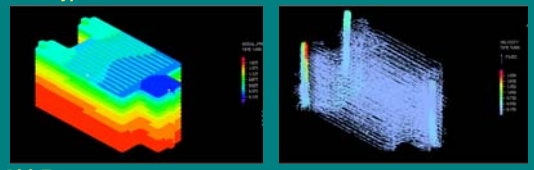


Single Cell Design

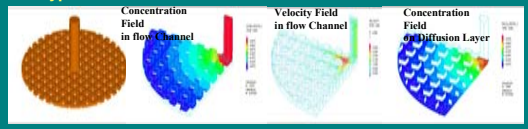


Fuel Cell Stack Design

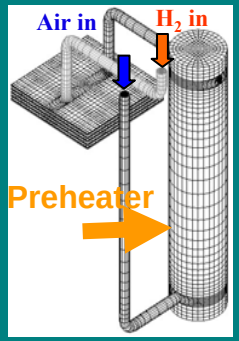
Plate Type

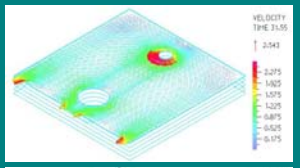


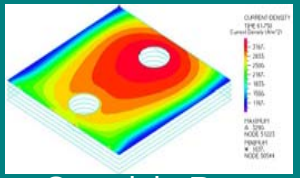
Disk Type



SOFC System Design

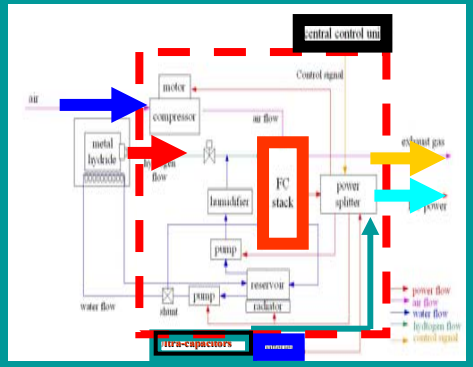




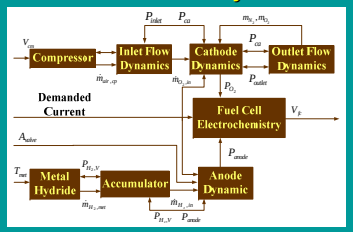


System Dynamics and Intelligent Control
系統動態與智慧控制

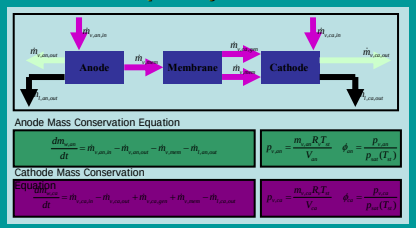
PEMFC System Dynamics and Intelligent Control



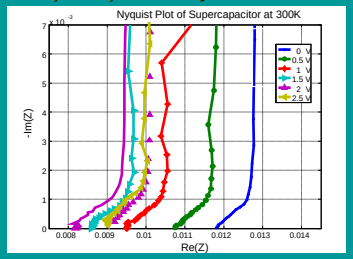
◆ FC Anode/Cathode Dynamics



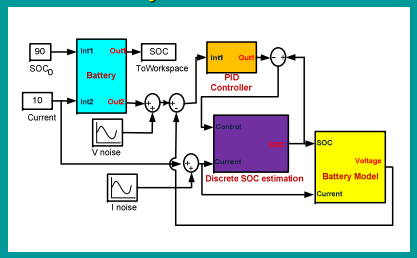
◆ Water Transport Dynamics



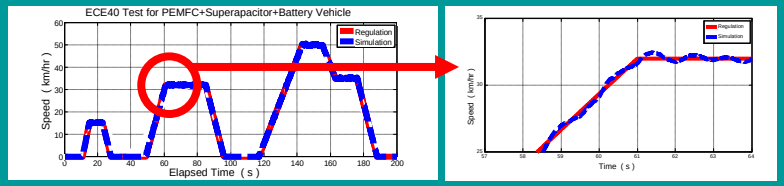
◆ Supercapacitor Dynamics



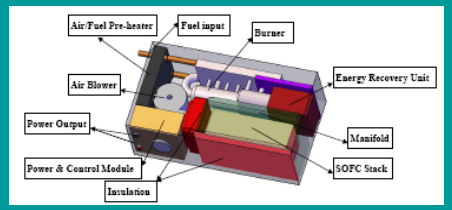
◆ Li-ion Battery SOC On-Line Detector

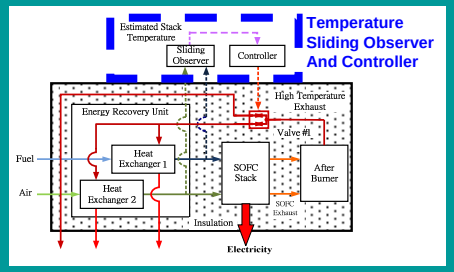


◆ ECE40 Dynamic Vehicle Performance Simulation



SOFC Micro APU System Dynamics and Control





◆ Turbo SOFC/MGT Hybrid Generation System Start-up Control