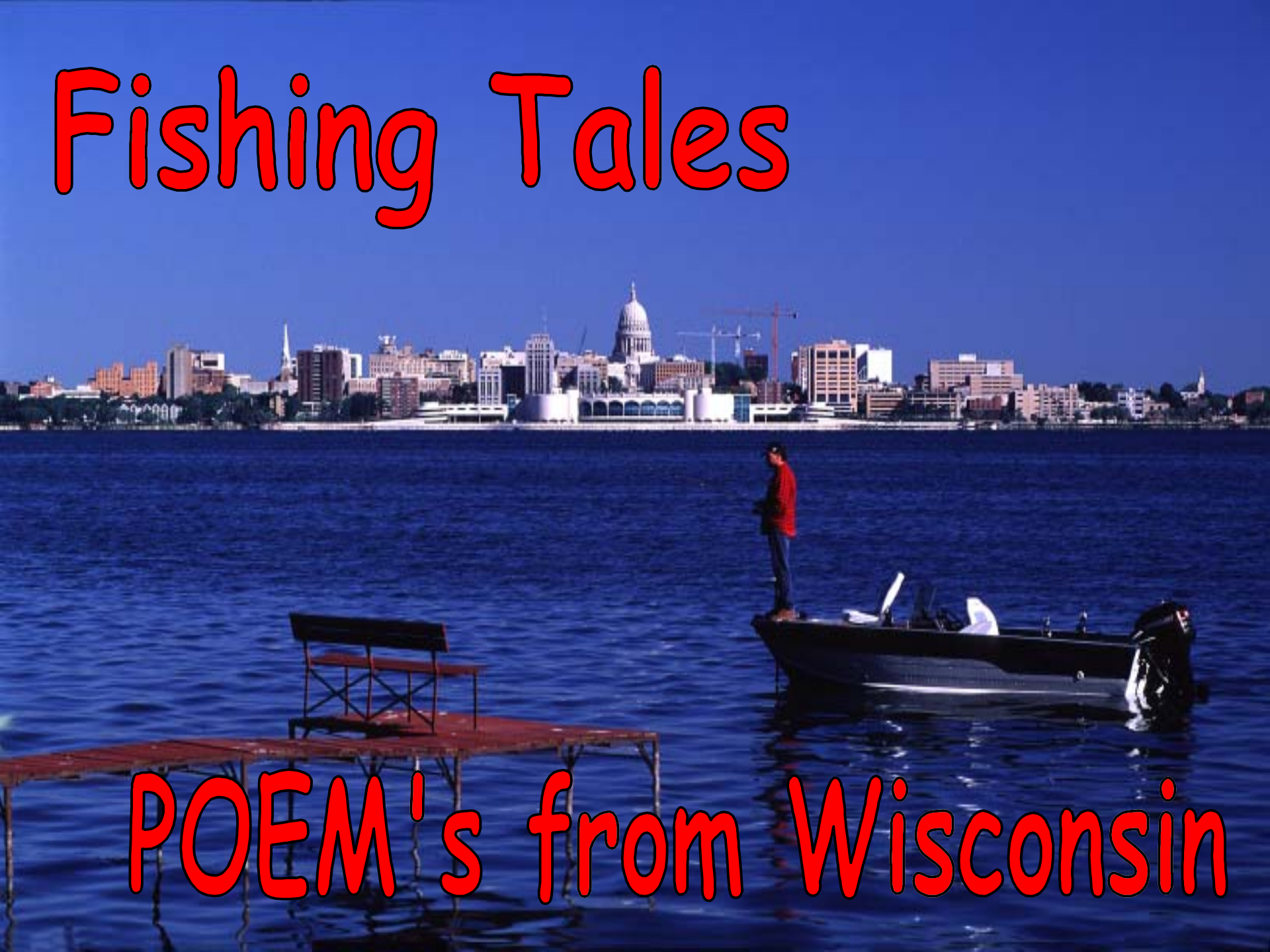
Fishing Tales



POEM's from Wisconsin

Fishing Tales

Chapter 1. POEM's vs PEM's

Chapter 2. Phys-Chem Props.of POEM's

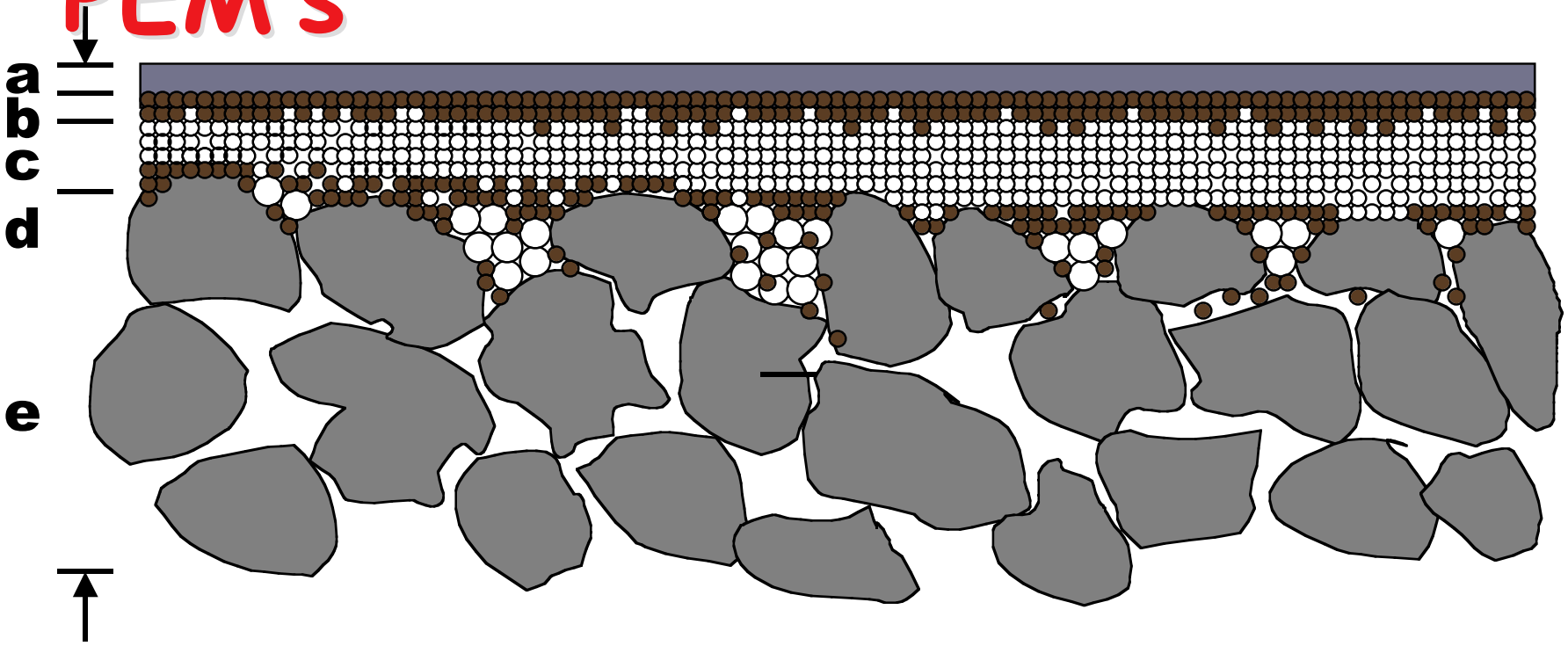
Chapter 3. Effect of Temperature

Chapter 4. Gas Separation

Chapter 5. Preliminary Performance Results

Chapter 6. Speculation

Chp 1. Of POEM's and PEM's



a = porous metal contact collector coating = anode

b = Pt loaded nanoparticle oxides = anode catalyst

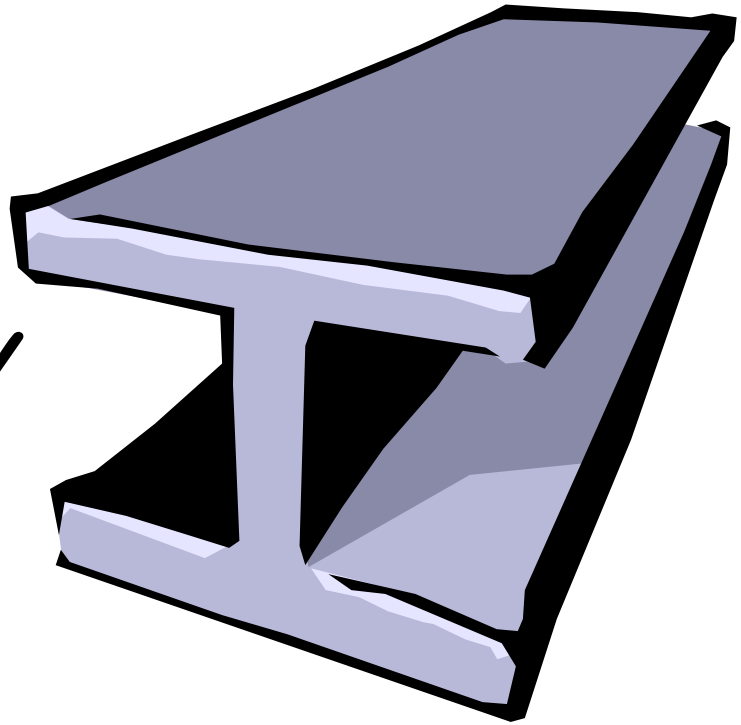
c = porous oxide electrolyte membrane (POEM)

d = composite sandwich layer = oxide fillers and cathode catalyst

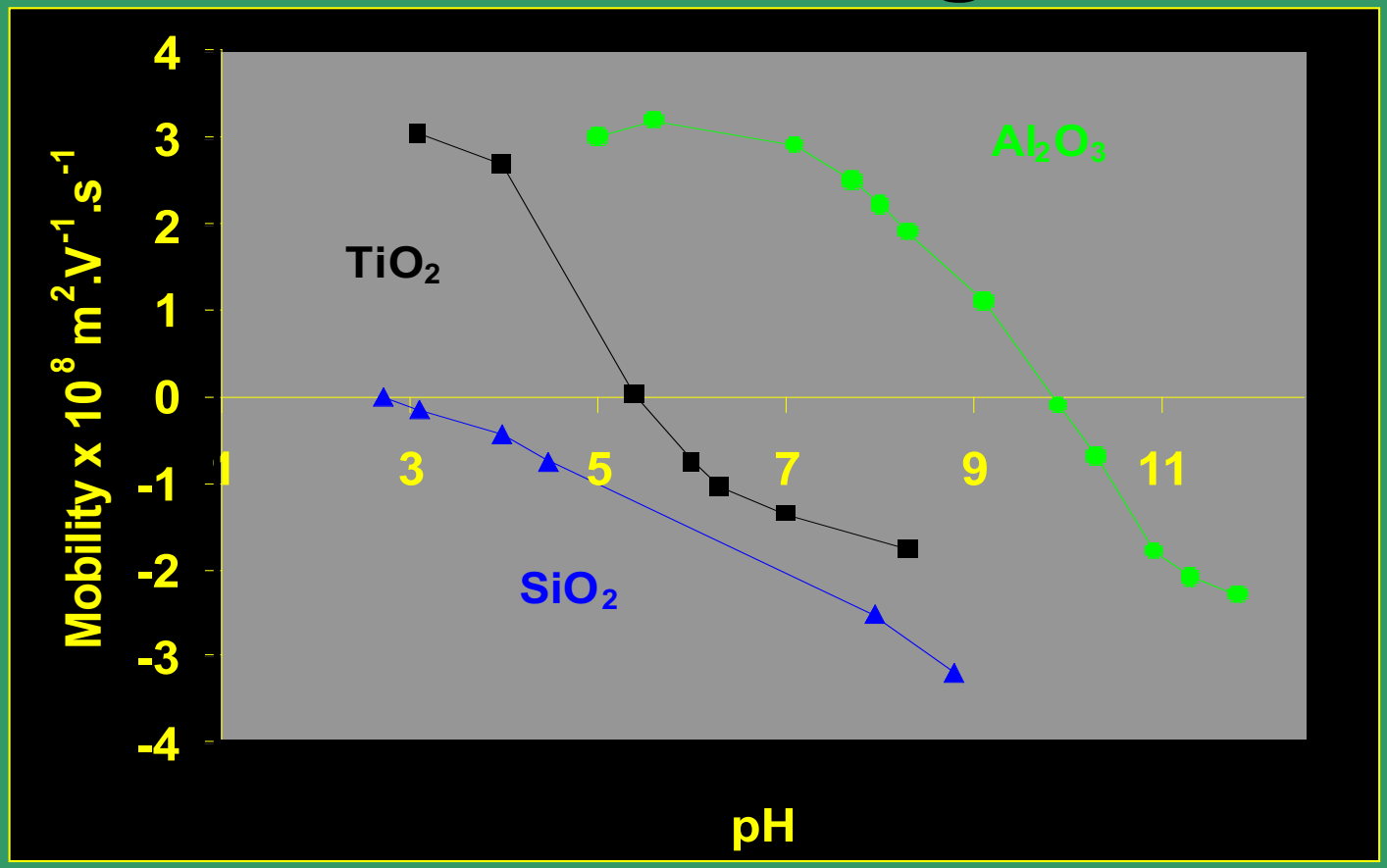
e = conducting porous support = metal or carbon

Chapter 2: Phys - Chem Properties of POEM's

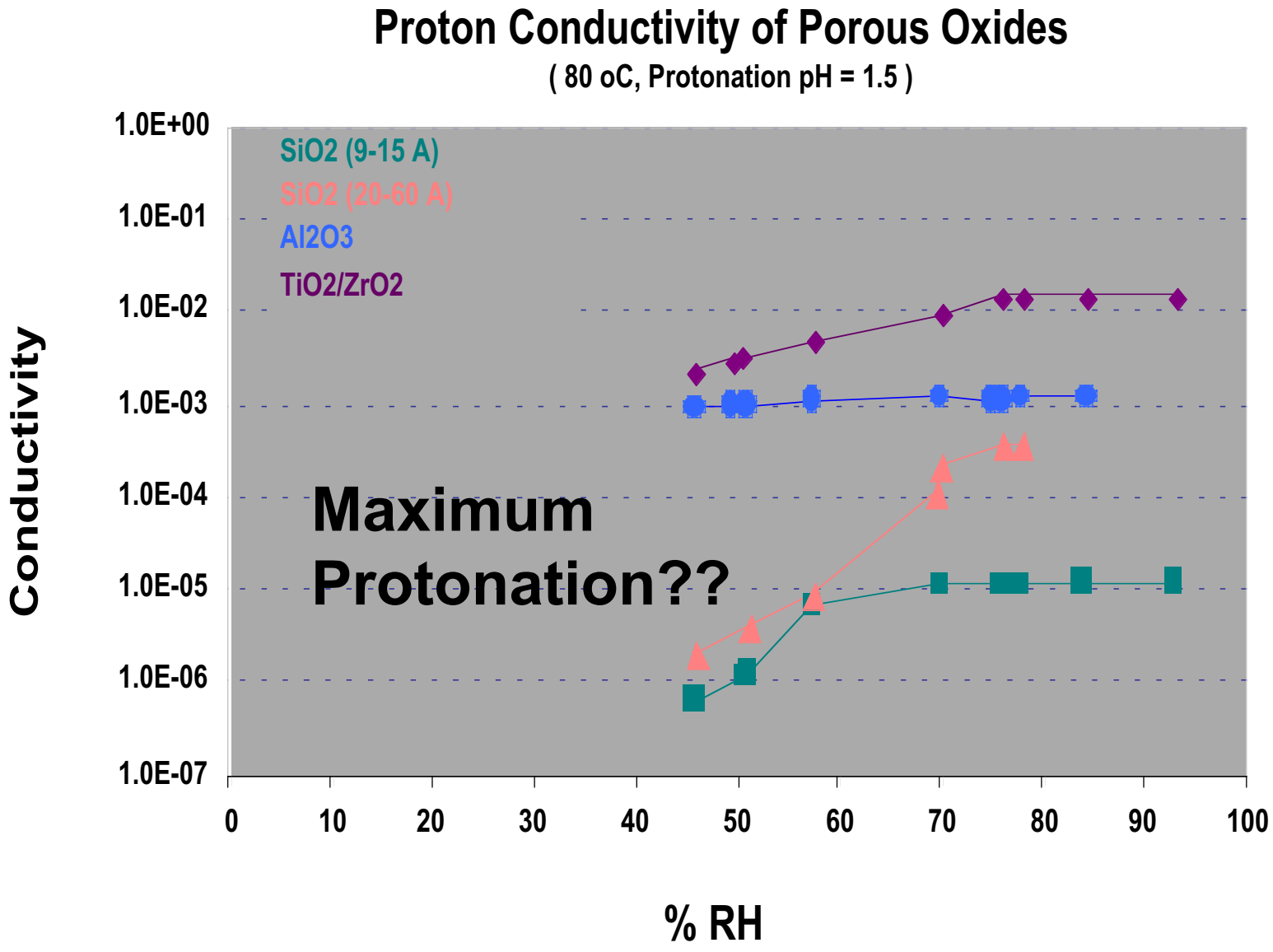
- *Type of Oxide*
- *Surface Chemistry*
- *Pore Structure*
- *Water Content*



Microporous Oxides = Proton Exchangers

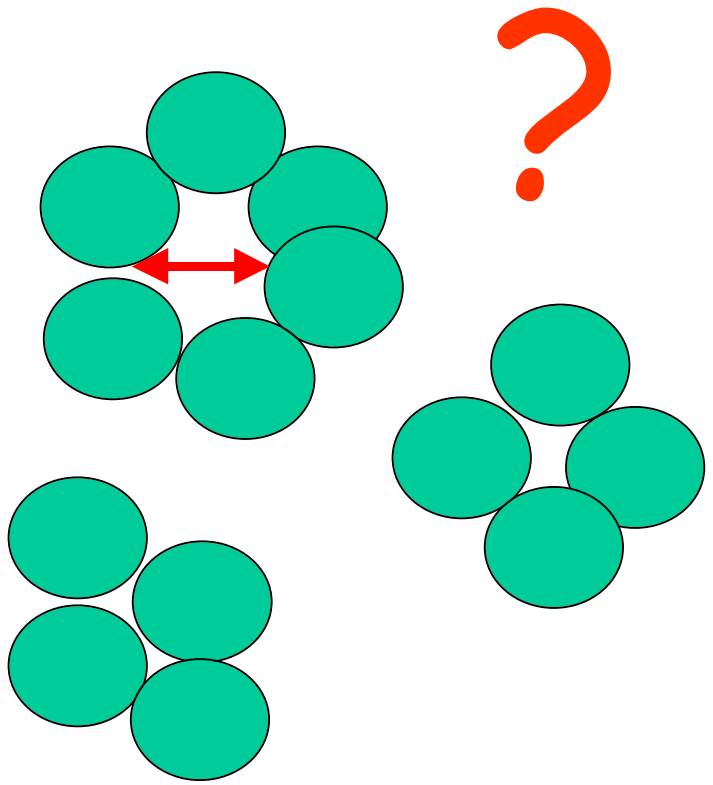


+ Surface Acidity: SiO_2 > TiO_2 > Al_2O_3


Proton Conductivity of Porous Oxides
(80 oC, Protonation pH = 1.5)
Conductivity
1.0E+00
1.0E-01
1.0E-02
1.0E-03
1.0E-04
1.0E-05
1.0E-06
1.0E-07
SiO2 (9-15 A)
SiO2 (20-60 A)
Al2O3
TiO2/ZrO2
Maximum
Protonation??
0
10
20
30
40
50
60
70
80
90
100
% RH

Pore Structure…

- Pore Size
- Surface Area
- Pore Volume

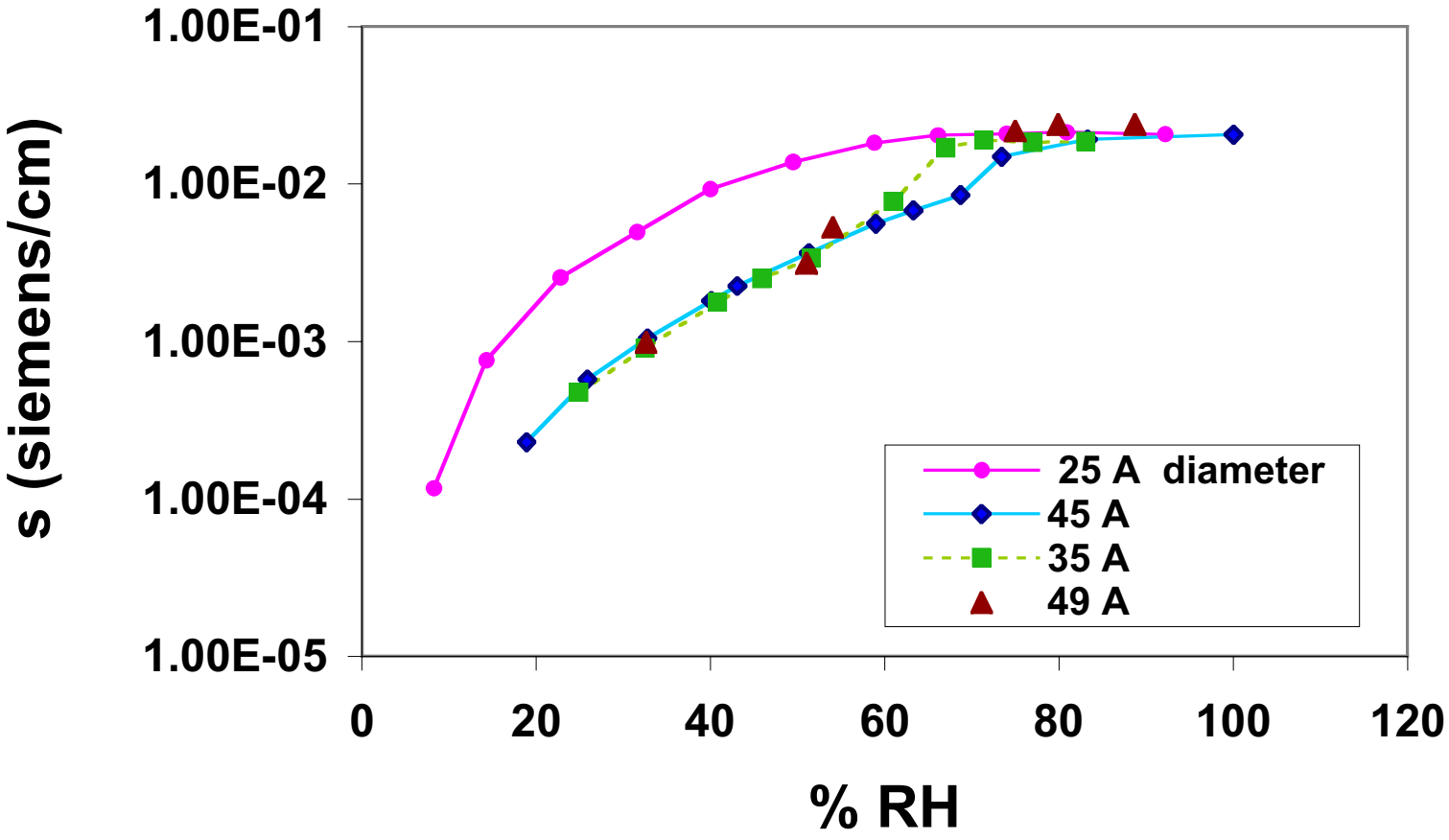


All Variables Affected by Particle Size and Particle Packing

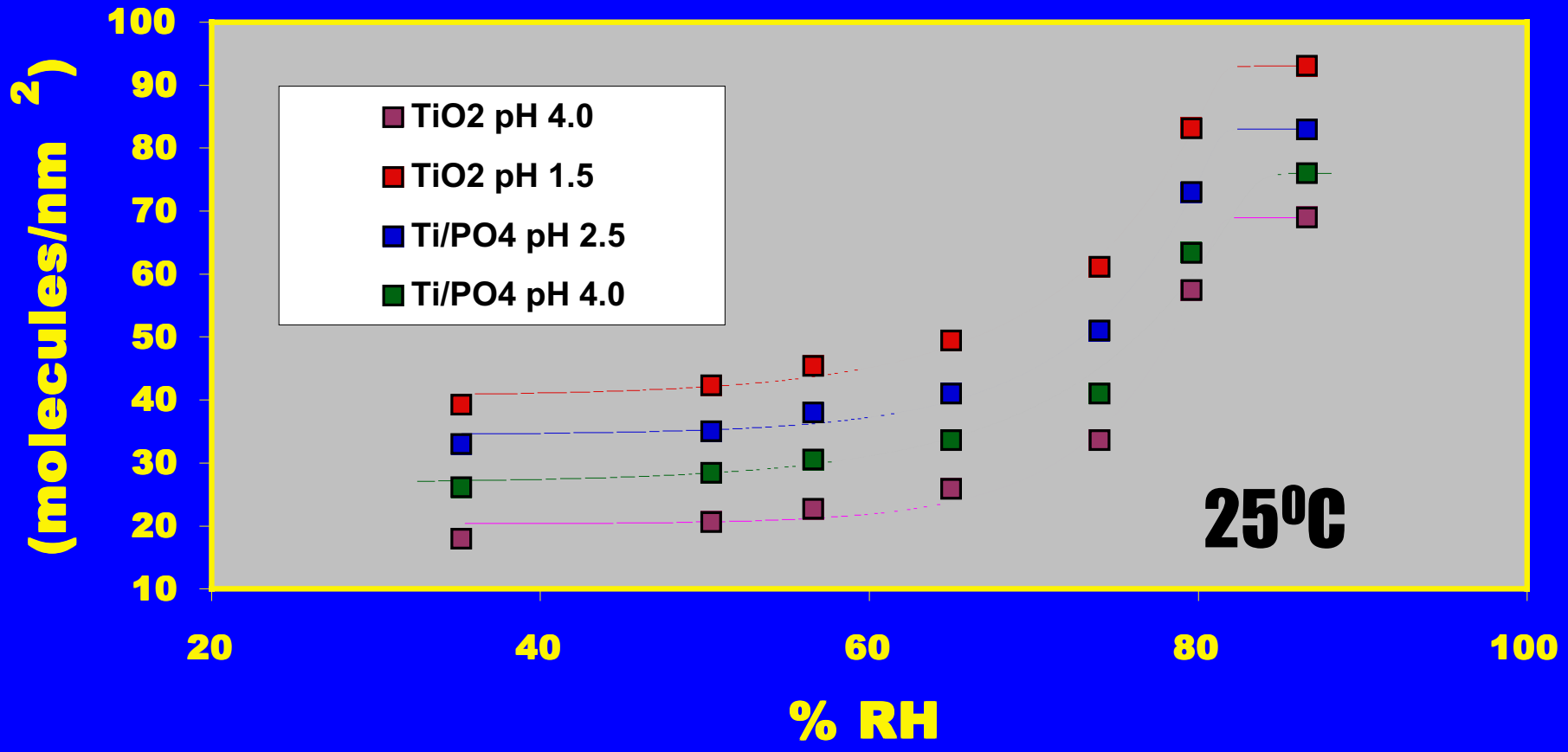
Pore Structure Parameters

	Pore Diameter	Surface Area (BET)	Pore Volume
T - 25	25 Ang.	237 m^2/g	0.179 cm^3/g
T - 35	35 Ang.	130 m^2/g	0.163 cm^3/g
T - 45	45 Ang.	97 m^2/g	0.159 cm^3/g

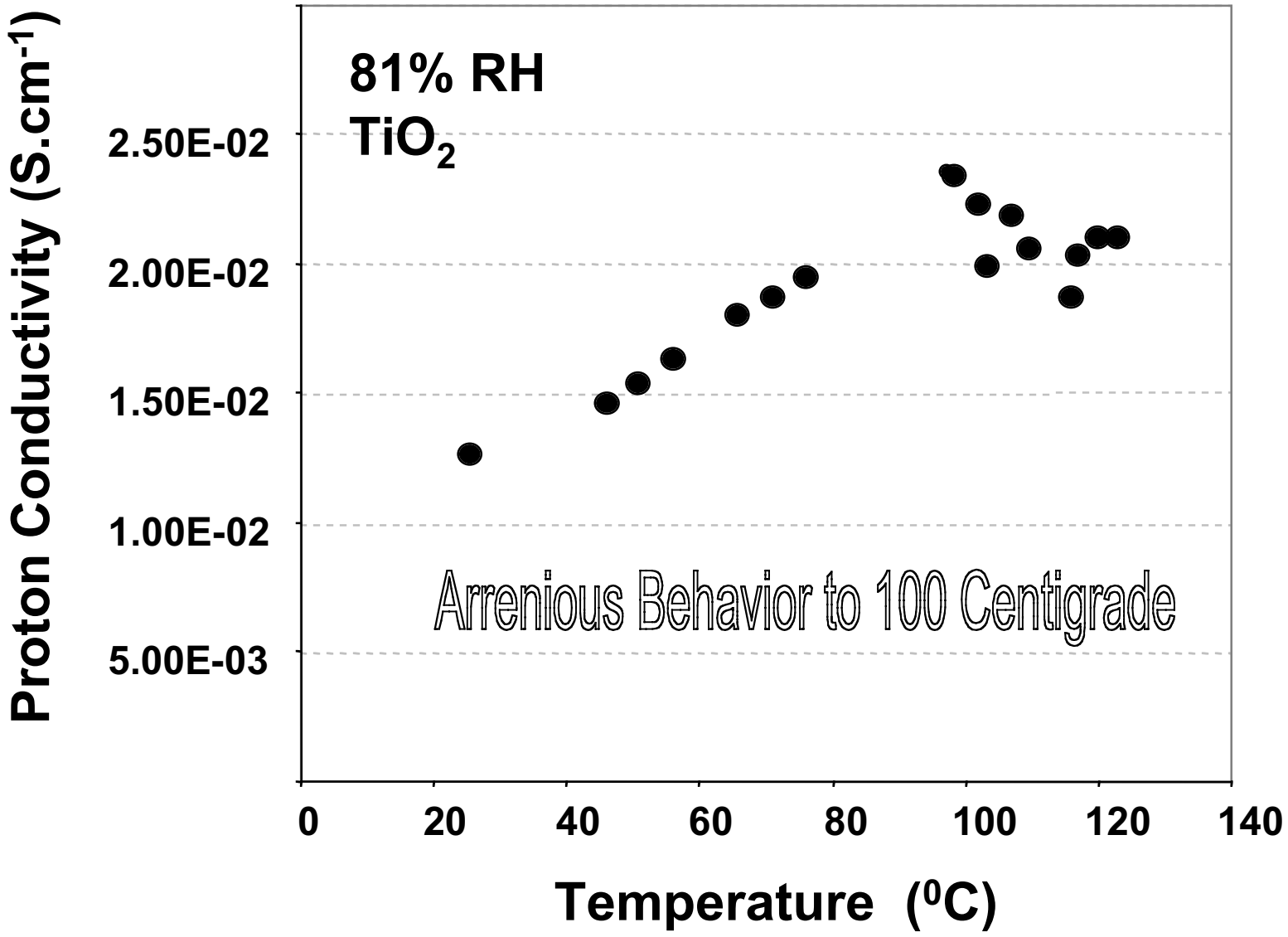
Proton Conductivity of TiO_2 Vs RH for Systems Having Different Pore Size but all at pH = 1.5 (25°C)



Adsorption Isotherms for Physi-Sorbed H_2O

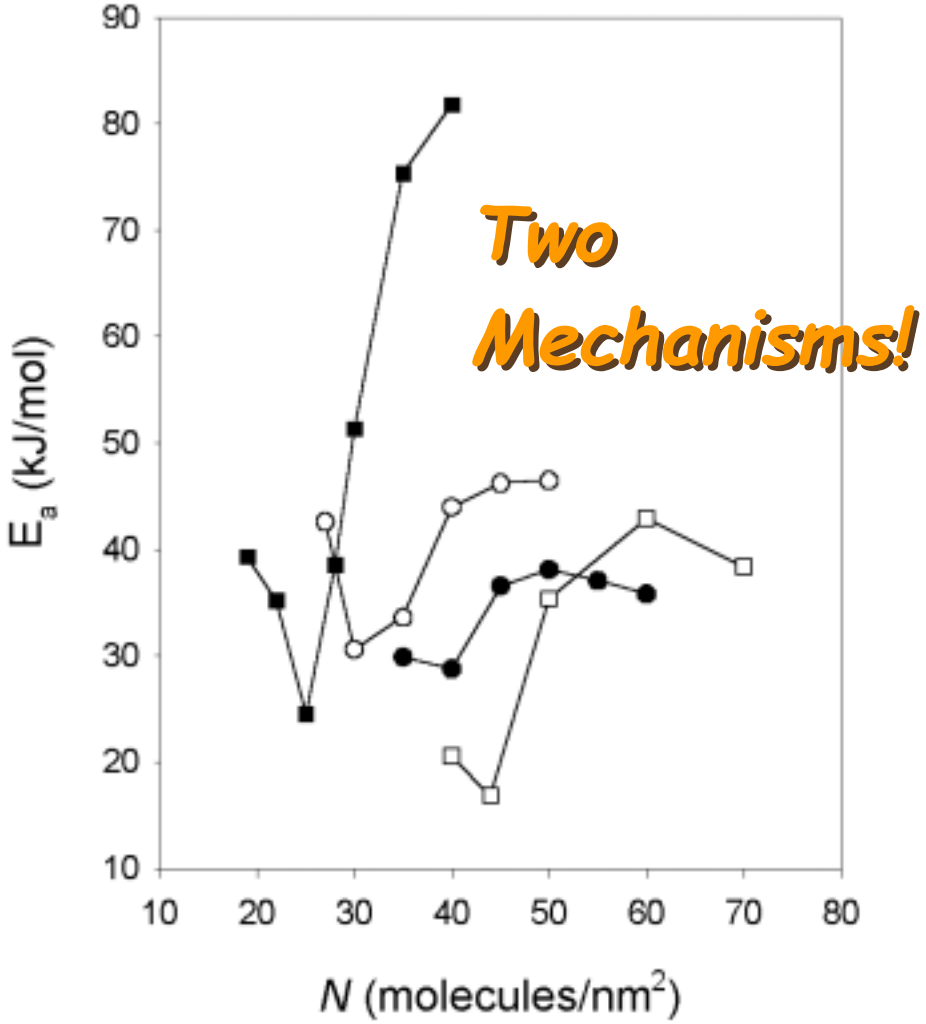


Chapter 3: Effect of Temperature

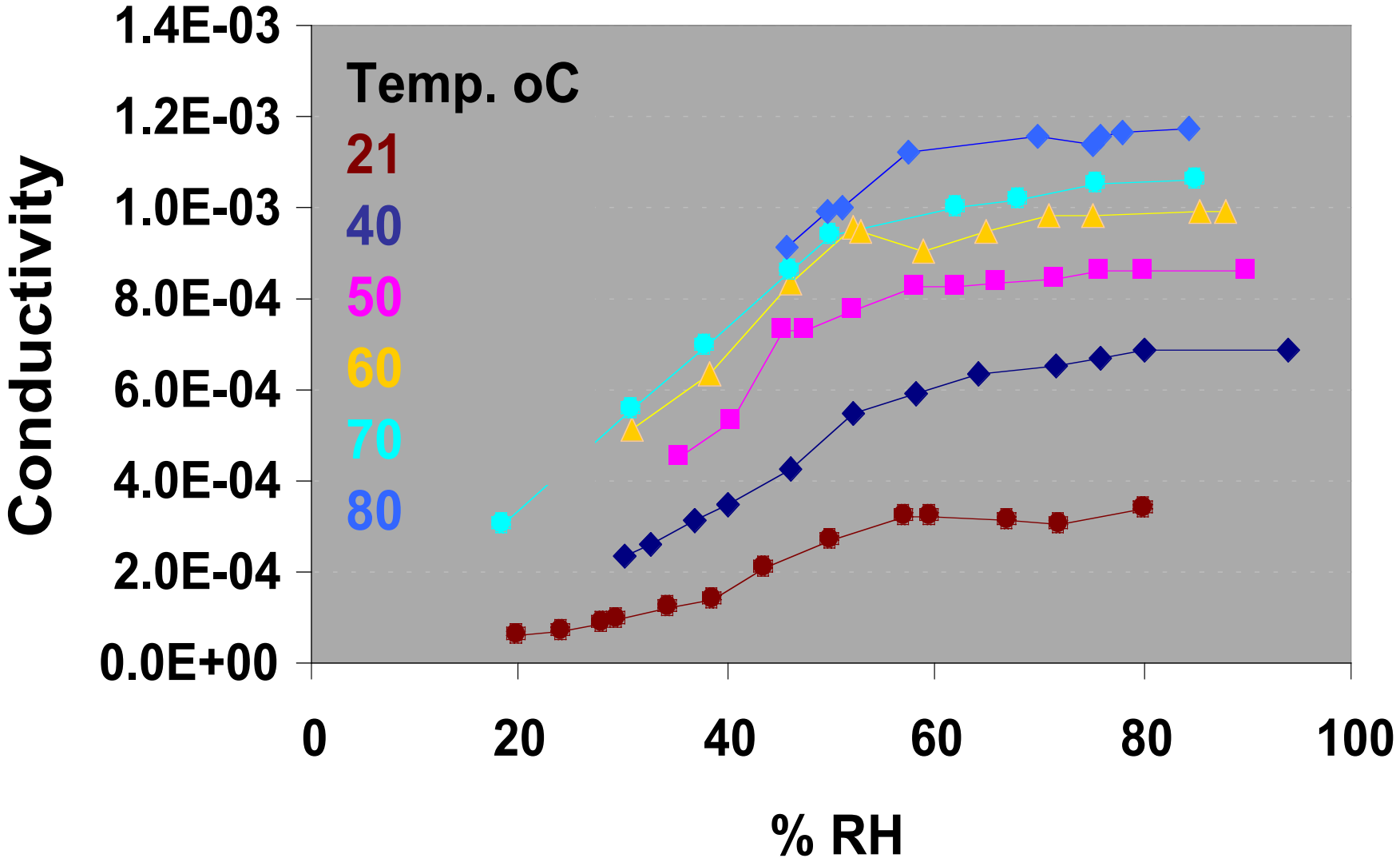


Effect of Water Content on the Proton Mobility Activation Energy

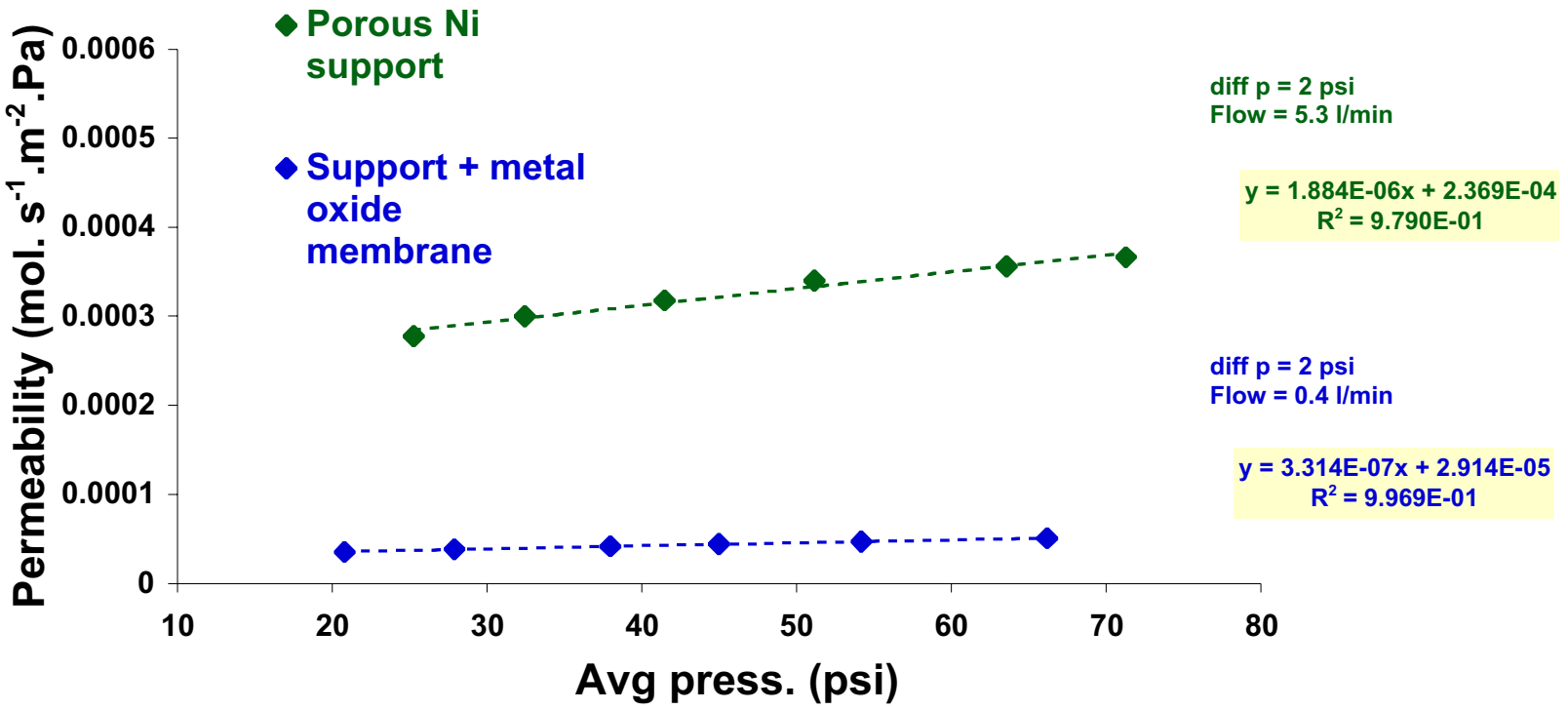
Ti400 (■)
Ti P pH 4.0 (○)
Ti P pH 2.5 (●)
Ti pH 1.5 (□)



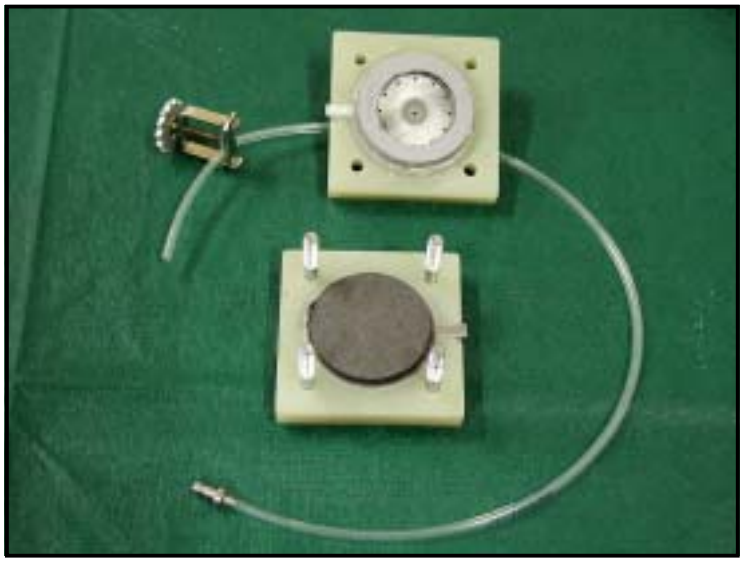
Proton Conductivity Isotherms for Microporous γ-Al_2O_3

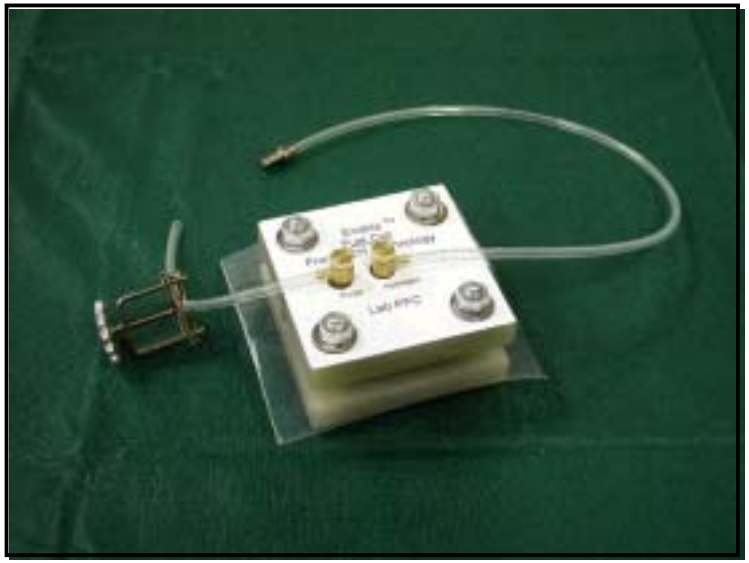


Chapter 4: Gas Separation



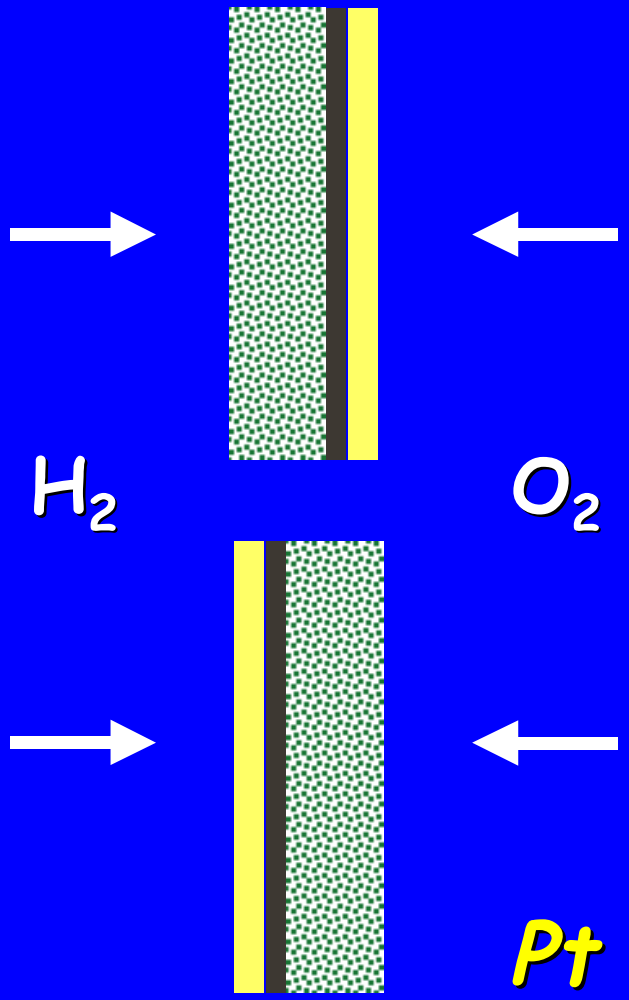
Chapter 5: Preliminary Results





Enable Passive Fuel Cells

Initial Data on Poem Performance as a 2/3MEA



Open Circuit Voltage

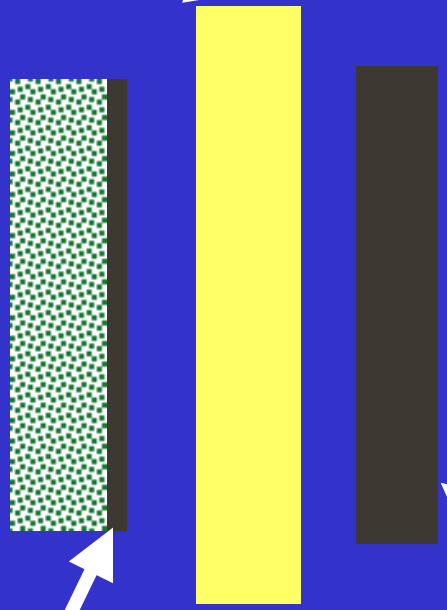
0.74 - 1.02 V

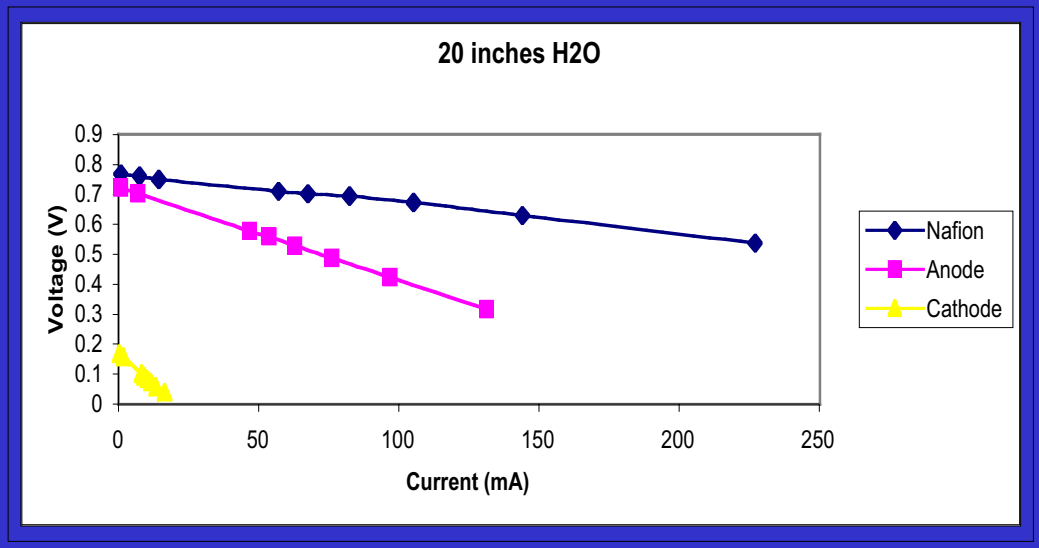
0.76 - 0.88 V

Pt content = 0.003 mg/cm²

Initial Data on Performance of Our Catalyst Layer

Nafion Membrane

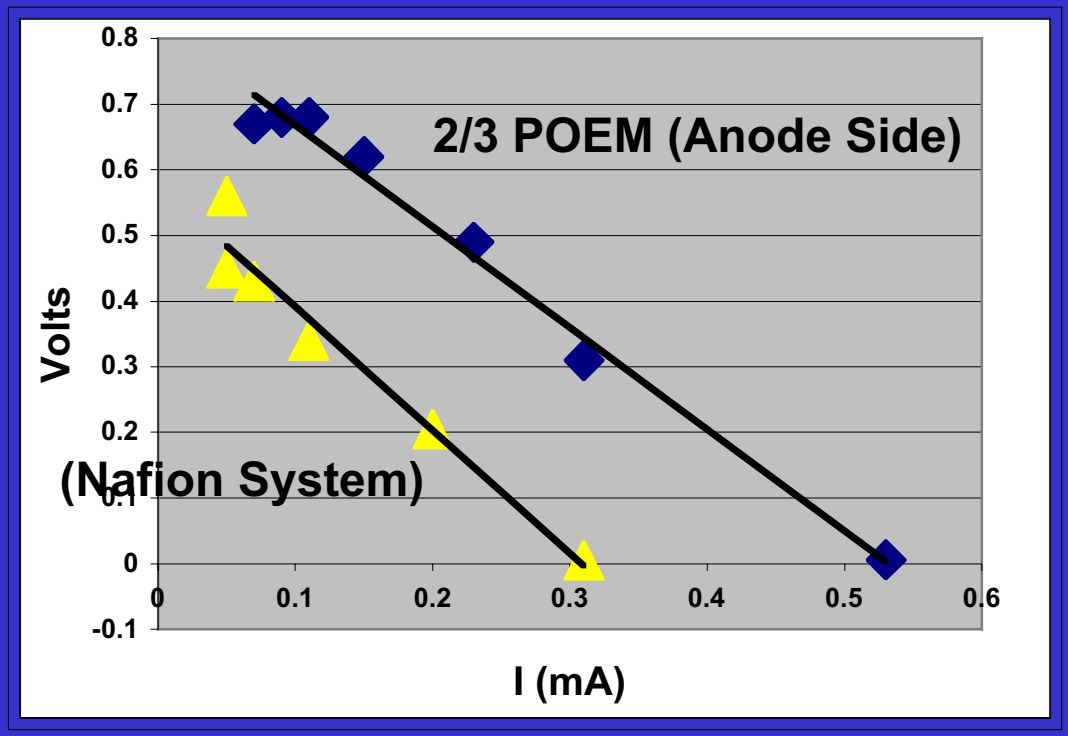




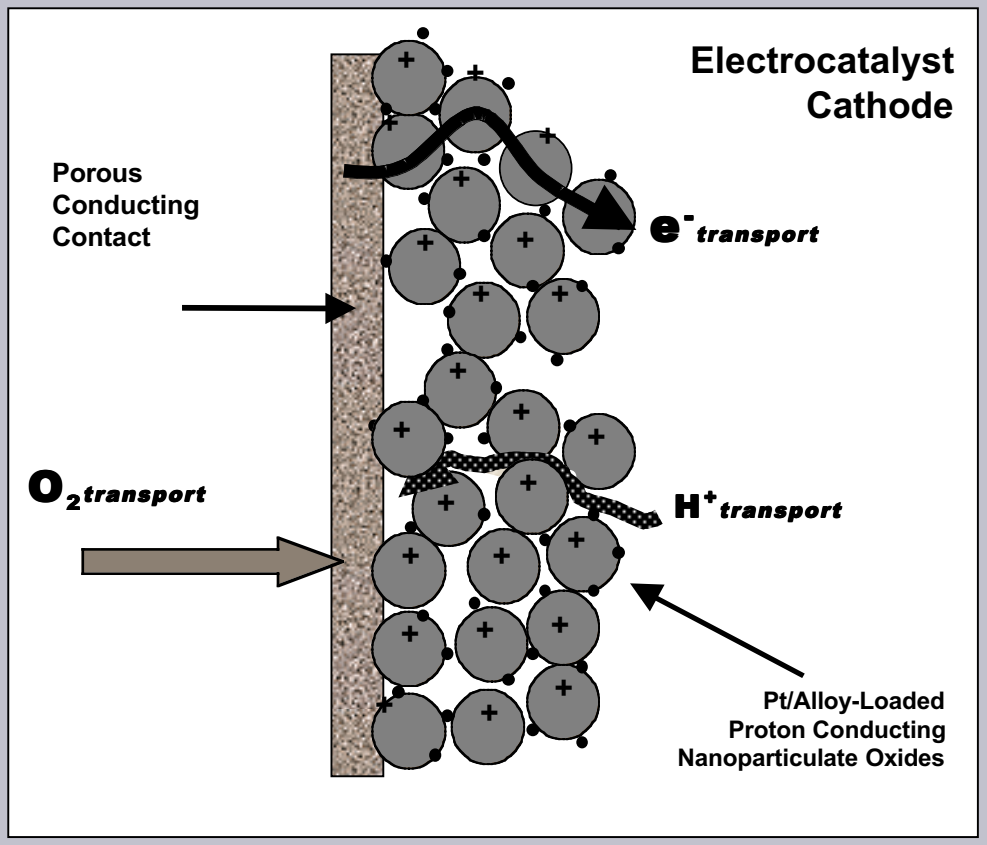
Nanoparticle TiO_2 - Pt Catalyst

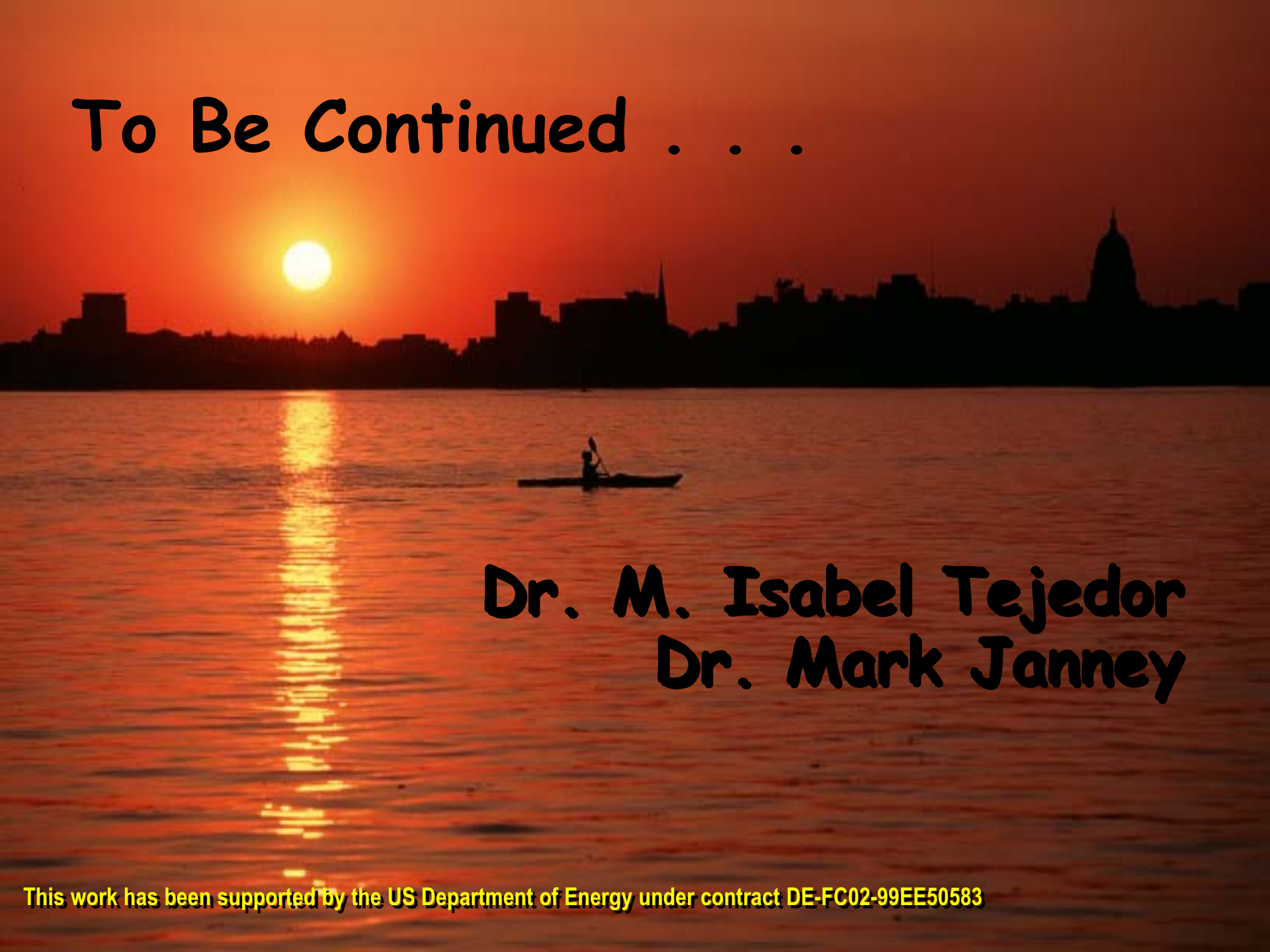
Commercial Catalyst

Our Own Test Cell…



Chapter 6: Speculation…





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