TIPS ON PRESENTING YOUR TECHNICAL WORK ORALLY

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www.chemeprof.com

"SPEAKING" GENERIC ADVICE

- http://business.financialpost.com/business-insider/7-excellent-ways-to-start-a-presentation-and-capture-your-audiences-attention

- Sorry… no

"GLIB" STATEMENT

- Tell them what you will tell them
- Tell them (clearly and succinctly)
- Tell them what you told them

SOME ASIDE

- Corrosion and West End Lead players
- Bach and Newton…

MATERIAL SELECTION/CAST SELECTION

- The many "warnings" about the corrosively of MEA in water, especially as the temperature increases is not a reason not to use the process, just that you have to use the proper materials…
  - this is just like:
- If you want to have a good production of "Gypsy" you need a "first call" West-End Lead Trumpet!
- https://www.youtube.com/watch?v=vL2c2RPkKiE

BACH/NEWTON

- Issac Newton: 1642-1726

The modern *F=ma* form of Newton's second law nowhere occurs in any edition of the *Principia* even though he had seen his second law formulated in this way in print during the interval between the second and third editions in Jacob Hermann's *Phoronomia* of 1716. Instead, it has the following formulation in all three editions: *A change in motion is proportional to the motive force impressed and takes place along the straight line in which that force is impressed*. In the

-

- JS BACH: 1685-1750

OUTLINE

- Define (to yourself) your message very clearly
- Organize your presentation to tell this message
- Slide format can be a matter of taste (+/- complexity), but make sure you can tell the "story" from them and that the reader is not unnecessarily distracted.
- Graphs need to be readable and convey the desired message
- Minimize tables of numbers (or don't use at all)
- Practice your presentation
- Engage the audience

DEFINE YOUR MESSAGE

- Why is the talk being given?
  - Informational vs. tutorial vs. persuasion(al)…
- Always consider the audience
  - Message needs to be adapted to meet the expectations and capabilities of the audience
- Pick 2-4 main points that you wish to transmit

ORGANIZE PRESENTATION TO TRANSMIT THIS MESSAGE

James N. Tilton DuPont, UD

- If informational (not tutorial)
  - Emphasize **what** you did not how you did it
- Time is always prescribed or limited
  - no matter what, I could not teach you something new and hard in 12 minutes.
    - I could tell you what I did however.
- Stay on your main points to be efficient

TALK ORGANIZATION

- Opening statement of who you are, the topic of interest and a statement of the key results.
- Introduction/background
  - This is your chance to say something interesting and "original" and hence make a positive impression.
- Theoretical foundation and experimental methods
  - Not original, but convince us you understand the principles
- Results (A few graphs, explain what we are really seeing!)
- Discussion of Results (Concisely state how the data match expected behavior, or do not, if the discrepancies are within your expected error bounds and if the experimental device had limitations that could be corrected.)
- Conclusions (Re-state the most significant results.)

SLIDE FORMAT

- You should have some discretion but…
  - Some fonts are easier to read than others
  - Some fonts are easier to read than others
  - Some fonts are easier to read than others
  - Some fonts are easier to read than others
  - Some fonts are easier to read than others
  - Some fonts are easier to read than others

SLIDE FORMAT

- Slides can be just text or a mix
- A mix may save time, but you have to be able to tell the story

Experiments and Analysis of Carbon Dioxide Capture Using a Model Ionic Liquid

Mark J. McCready, Edward J. Maginn, William F. Schneider and Joan F. Brennecke
University of Notre Dame

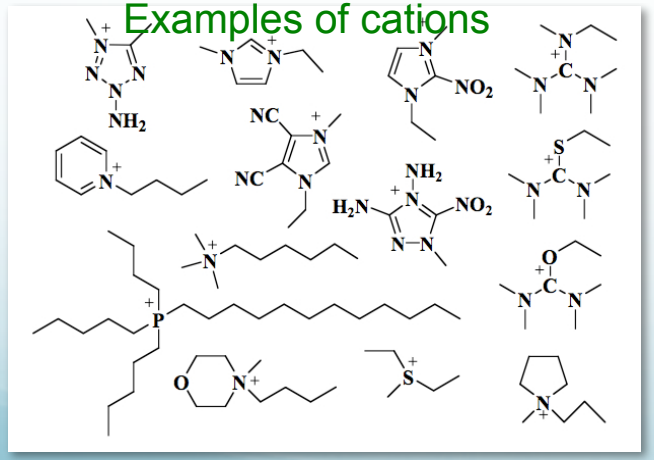
Process tradeoffs

- The primary tradeoffs for the process involve value of heat of reaction
  - Increase: higher IL capacity at lower temperature in absorber, lower IL holdup
  - Decrease: Lower heat of regeneration (desorber), less need for sensible heat exchange
  - Given some limits on temperatures, an intermediate value could give greatest "delta- concentration"

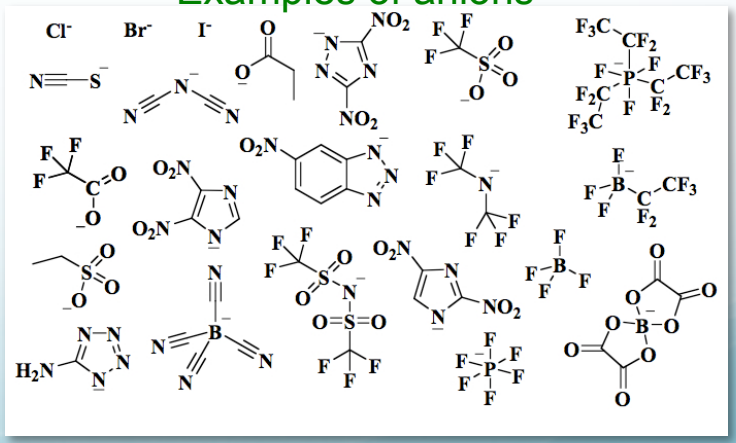
Ionic Liquids and Their Potential as CO_2 Sorbents

- Pure salts that are liquid around ambient temperature
  - Not simple salts like alkali halides
- Many favorable properties
  - Nonvolatile
  - Anhydrous (or variably hydrous)
  - High thermal stability
  - Huge chemical diversity
  - High intrinsic CO_2 solubility and selectivity

Examples of cations



Examples of anions



Measuring reaction rates of CO_2/IL systems

Theory:

$$D_{CO2}\frac{\partial^2 C_{CO2}}{\partial x^2} = \frac{\partial C_{CO2}}{\partial t} + r(x,t)$$

$$C_{CO2} = 0 \text{ at } x > 0, t = 0$$
$$C_{CO2} = C^*_{CO2} \text{ at } x = 0, t > 0$$
$$C_{CO2} = 0 \text{ at } x = \infty, t > 0$$

Assumption: Change in IL concentration is negligible hence treated as a constant. This implies that CO_2 flux is very small so that IL is not depleted at the surface and reaction product diffuses away from the surface relatively fast.

Pseudo-first order reaction

$$r = k \cdot C_{CO2}$$

$$\bar{R} = kla \cdot C^*_{CO2} \cdot E$$

$$J = \sqrt{k \cdot D_{CO2}} \cdot C^*_{CO2}$$

where $1 < E << E^{\infty}$

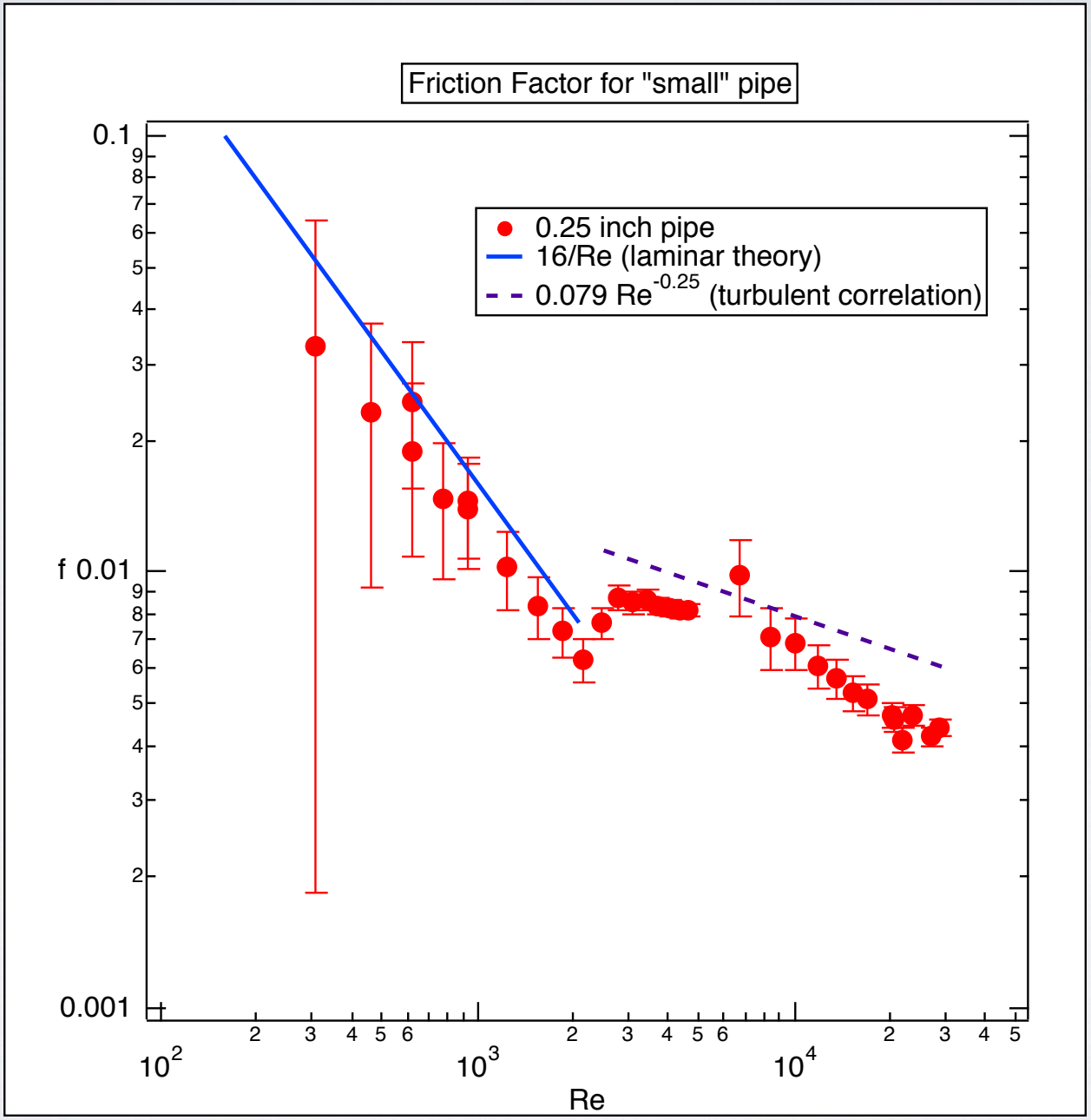
$$E = Ha = \sqrt{\frac{k \cdot D_{CO2}}{kl^2}}$$

$$E^{\infty} = \sqrt{\frac{D_{CO2,L}}{D_{IL,L}}} + \sqrt{\frac{D_{IL,TG}}{D_{CO2,L}}}\frac{C_{IL}}{v \cdot C^*_{CO2}}$$

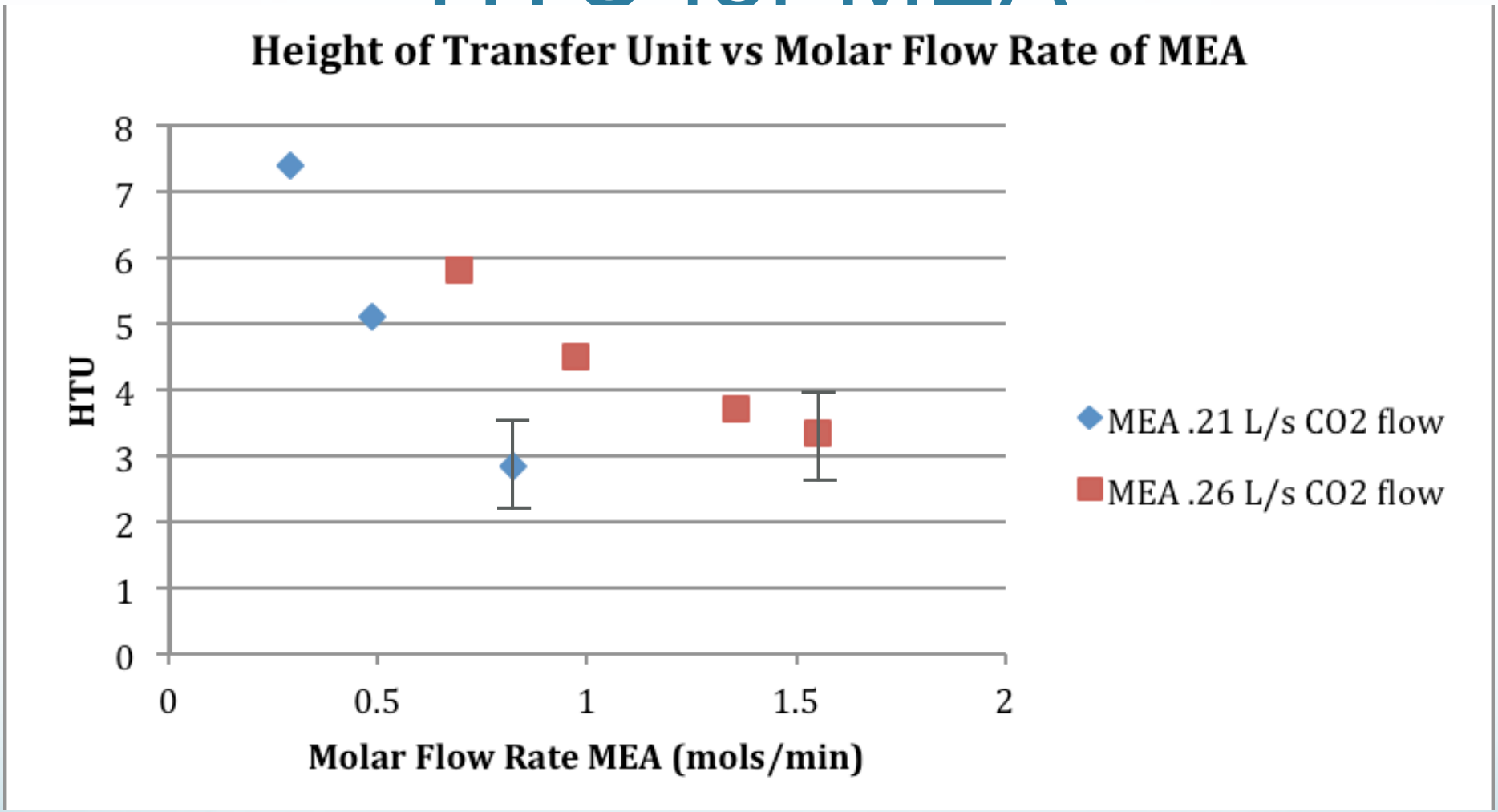
GRAPHS AND FIGURES

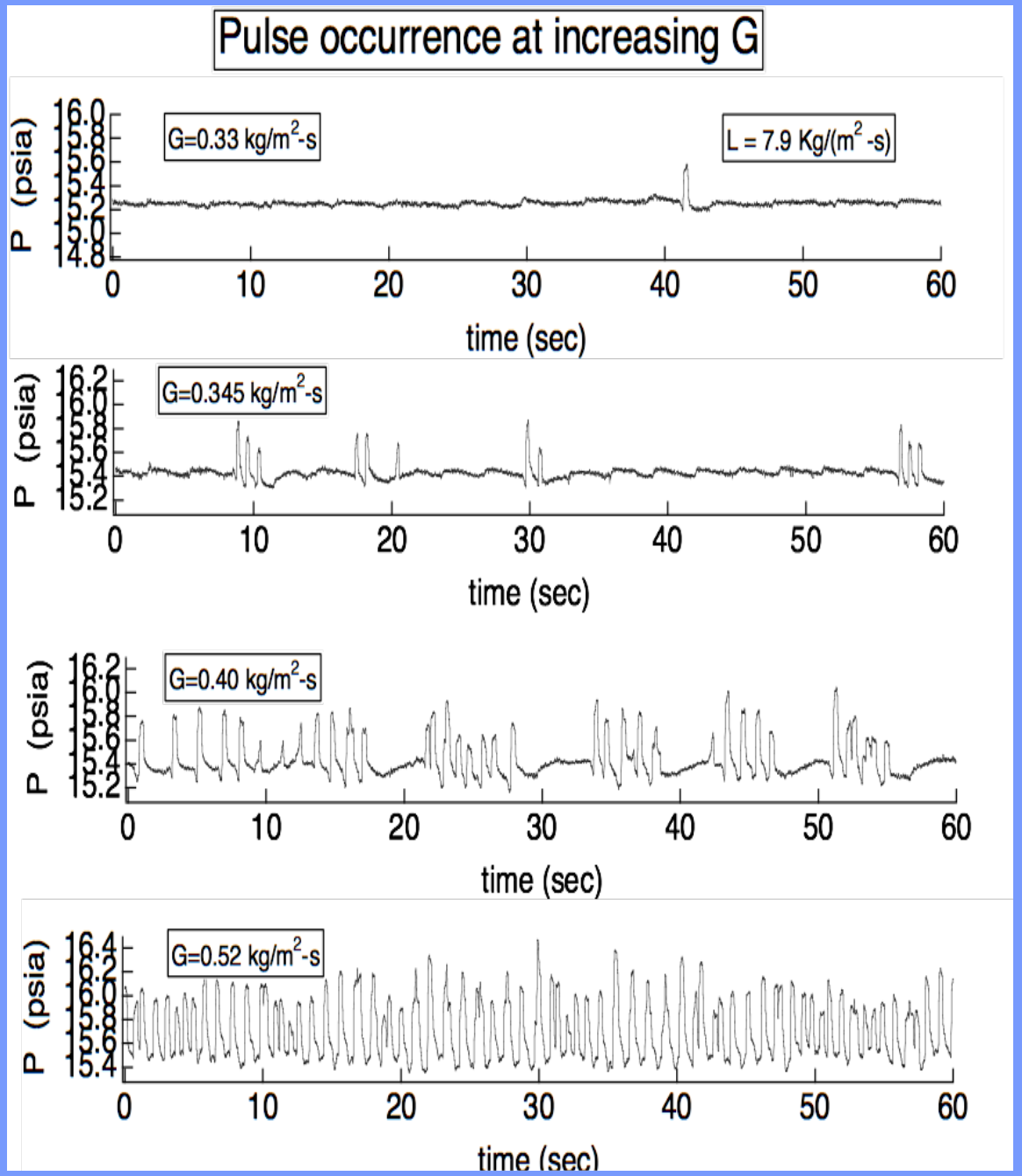
- Graphs need to be readable and tell what you need them to do
- Figures need to be as simple as possible

PIPE FLOW DATA



HTU for MEA

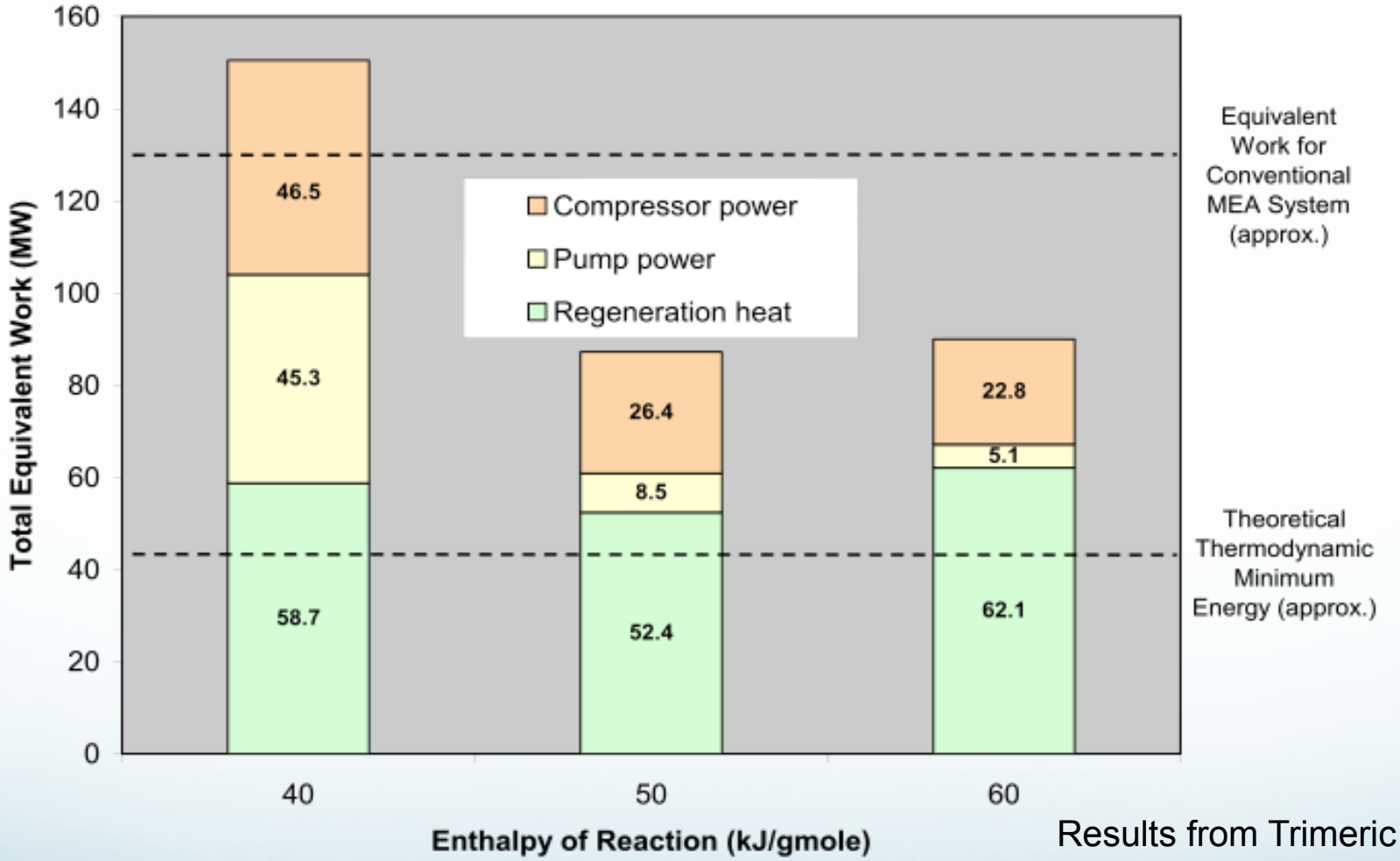

Height of Transfer Unit vs Molar Flow Rate of MEA
HTU
8
7
6
5
4
3
2
1
0
0
0.5
1
1.5
2
Molar Flow Rate MEA (mols/min)
MEA .21 L/s CO2 flow
MEA .26 L/s CO2 flow



Mass transfer increases by a factor of 3-4 in a pulse

mjm@nd.edu http://www.nd.edu/~mjm chemeprof.com

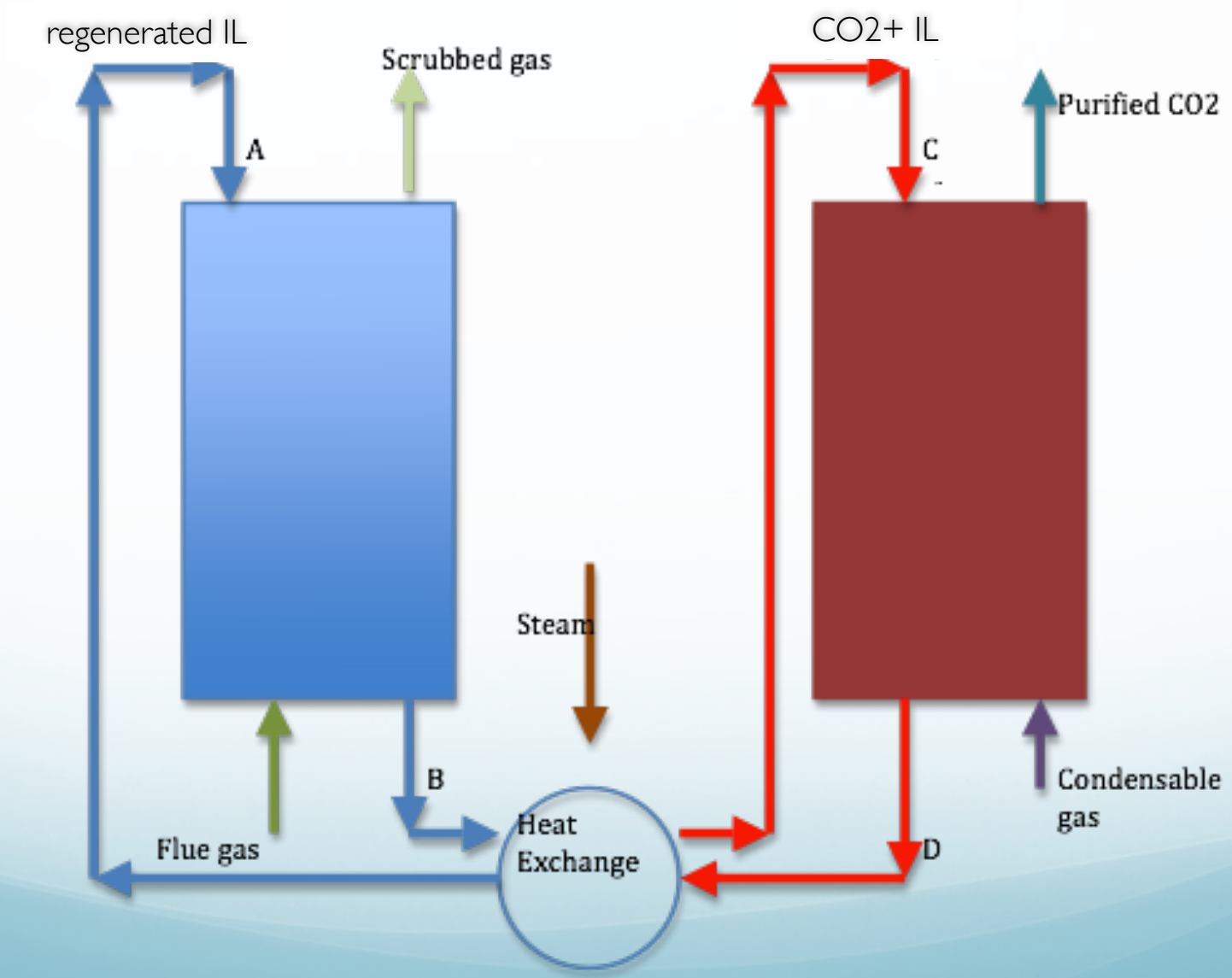
Optimal binding energy from process modeling



Results from Trimeric Corp.

Can ILs be designed with optimal CO_2 reaction enthalpy?

Ionic Liquid Process schematic



Absorber/Desorber for CO2 removal

- We have run continuous steady-state operation of absorber and regenerator.

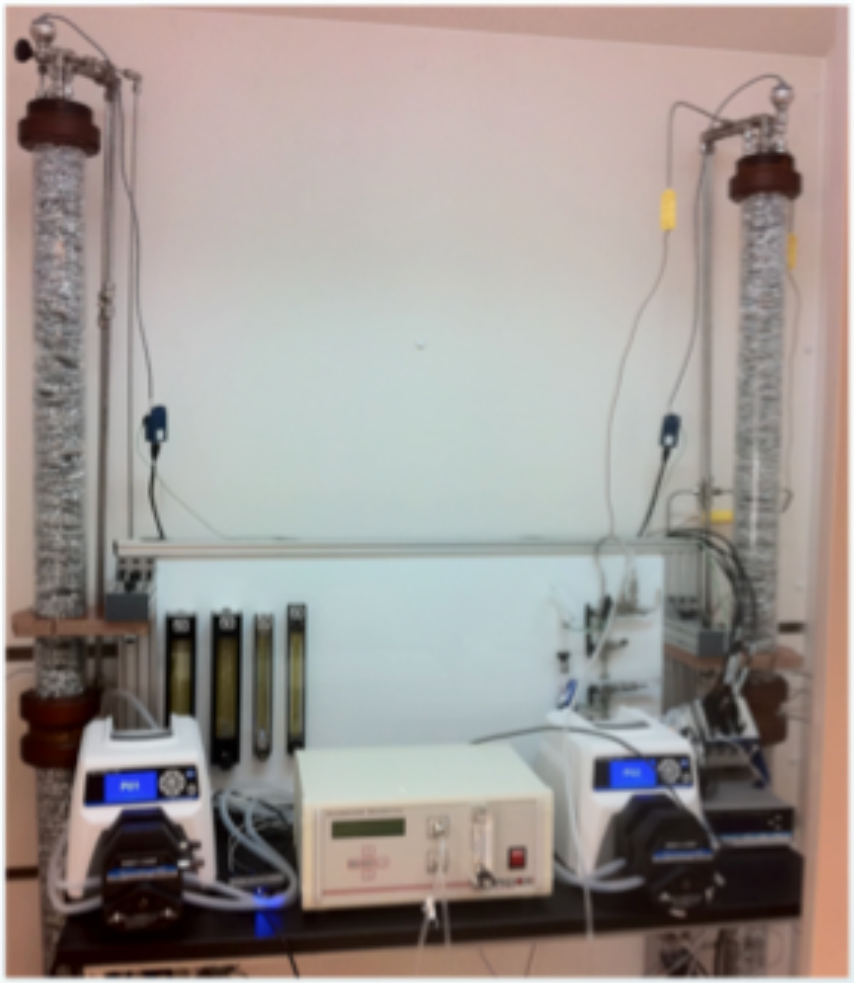
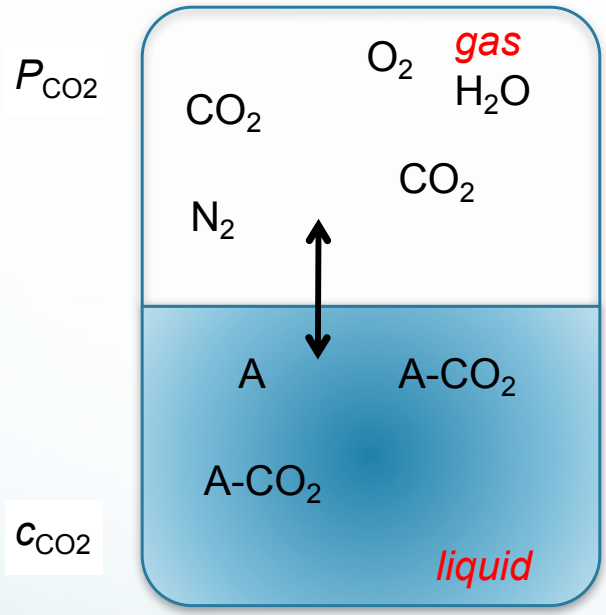


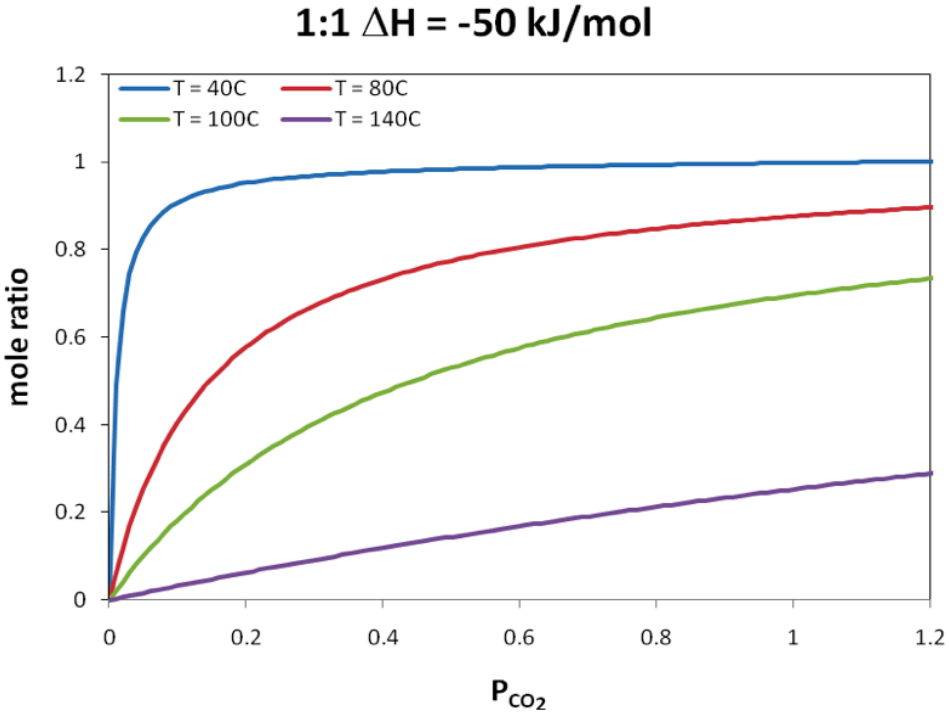
Figure 1: Image of the lab-scale unit constructed for Task 18.

Absorption isotherms

Langmuir (single site) absorption

$A + CO_2\,(g) \leftrightarrow A \cdot CO_2 \quad K_{eq}(T)$





$$c_{CO_2} = \frac{K P_{CO_2}}{1 + K P_{CO_2}}, K = e^{-\Delta G^\circ(T)/RT}$$

$$\Delta S^\circ(T) \approx -S^\circ_{\mathrm{trans},CO_2}(T)$$

$$\Delta H^\circ(T) \rightarrow \text{bond strength}$$

Analysis (for global instability)

- Averaged momentum equations

$$\frac{\partial \varepsilon_k \bar{\rho}_k}{\partial t} + \nabla \cdot \varepsilon_k \bar{\rho}_k \mathbf{v}_k = 0$$

$$\frac{\partial \varepsilon_k \bar{\rho}_k \mathbf{v}_k}{\partial t} + \nabla \cdot \varepsilon_k \bar{\rho}_k \mathbf{v}_k \mathbf{v}_k = \nabla \cdot \varepsilon_k \left(\bar{\mathbf{T}} + \mathbf{T}_\mathbf{k}^{\mathbf{Re}} \right) + \varepsilon_k \bar{\rho}_k \mathbf{b}_\mathbf{k}$$

- Following the standard simplifications

$$\frac{\partial \varepsilon_k \bar{\rho}_k \mathbf{v}_k}{\partial t} + \nabla \cdot \varepsilon_k \bar{\rho}_k \mathbf{v}_k \mathbf{v}_k = \varepsilon_k \nabla p_k + \boxed{p_k \nabla \varepsilon_k} + F_i + \varepsilon_k \bar{\rho}_k \mathbf{b}_\mathbf{k}$$

New key term

DON'T USE TABLES OF NUMBERS ON SLIDES

76,820	64,007	140,827	0	71,444	69,383
0	0	0	0	0	0
66,219	108,371	174,590	0	57,278	117,312
0	108,770	108,770	0	120,000	(11,230)
0	0	0	18,411	18,411	0
0	90,699	90,699	0	0	90,699
0	0	0	0	0	0
0	107,824	107,824	23,961	0	131,785
0	23,961	0	0	0	0
0	91,018	91,018	0	0	91,018
0	101,375	101,375	0	0	101,375
0	109,180	109,180	0	0	109,180
0	95,301	95,301	0	0	95,301
0	0	0	0	0	0
0	113,026	113,026	0	0	113,026
0	75,173	75,173	0	0	75,173
0	83,210	83,210	0	0	83,210
0	72,701	72,701	0	0	72,701
0	73,130	73,130	0	0	73,130
128,125	0	128,125	0	0	54,237
0	78,634	78,634	0	0	78,634
35,930	0	35,930	0	30,930	5,000

PRACTICE

- Talk through until you are comfortable
- If you can't become comfortable, use notes
- Memorize the first "line" for each slide

ENGAGE THE AUDIENCE

- Unless you are looking into a camera….
- Spend at least 1/2 of the time looking at people in the audience,
  - all the better if you actually make eye contact!
    - but not with only a few people!!
- Hopefully they are engaged and with you this generates some mutual "synergetic energy".
- If they seem lost, perhaps you can step up the energy level a bit to re-engage them

CONCLUSIONS

- Pick 2-3 "results" and craft the "story" to support these
- Organize your presentation to tell this message
- Slides need to be readable and clearly explainable by you
- Make sure to repeat/emphasize the "take-away" message
- Practice!
- Engage the audience