

CO₂ CAPTURE and SEQUESTRATION

Sapient's Institute, New Brunswick, NJ

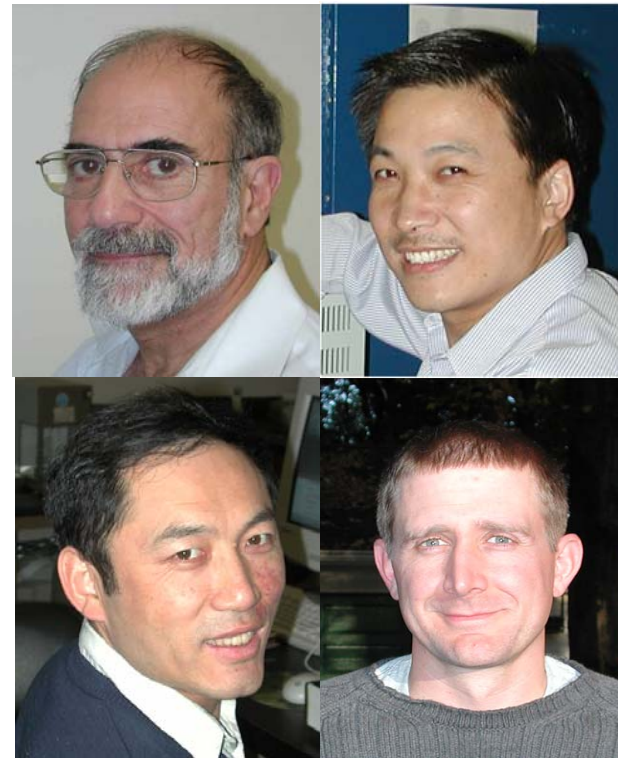
Carbozyme, Inc., Bordentown, NJ

M.C. Trachtenberg

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J.-J. Ge

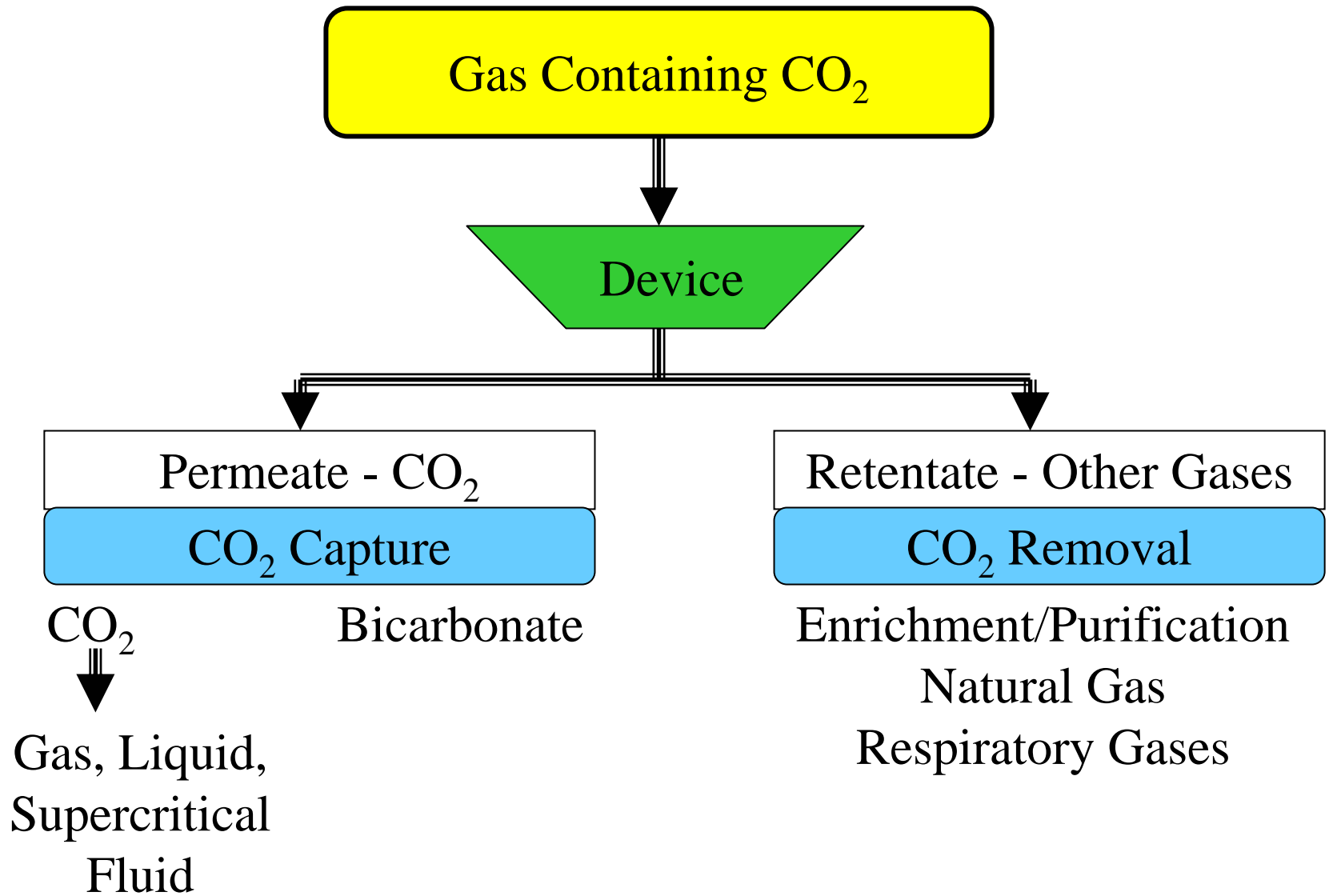


NSF 2002
New Orleans, LA

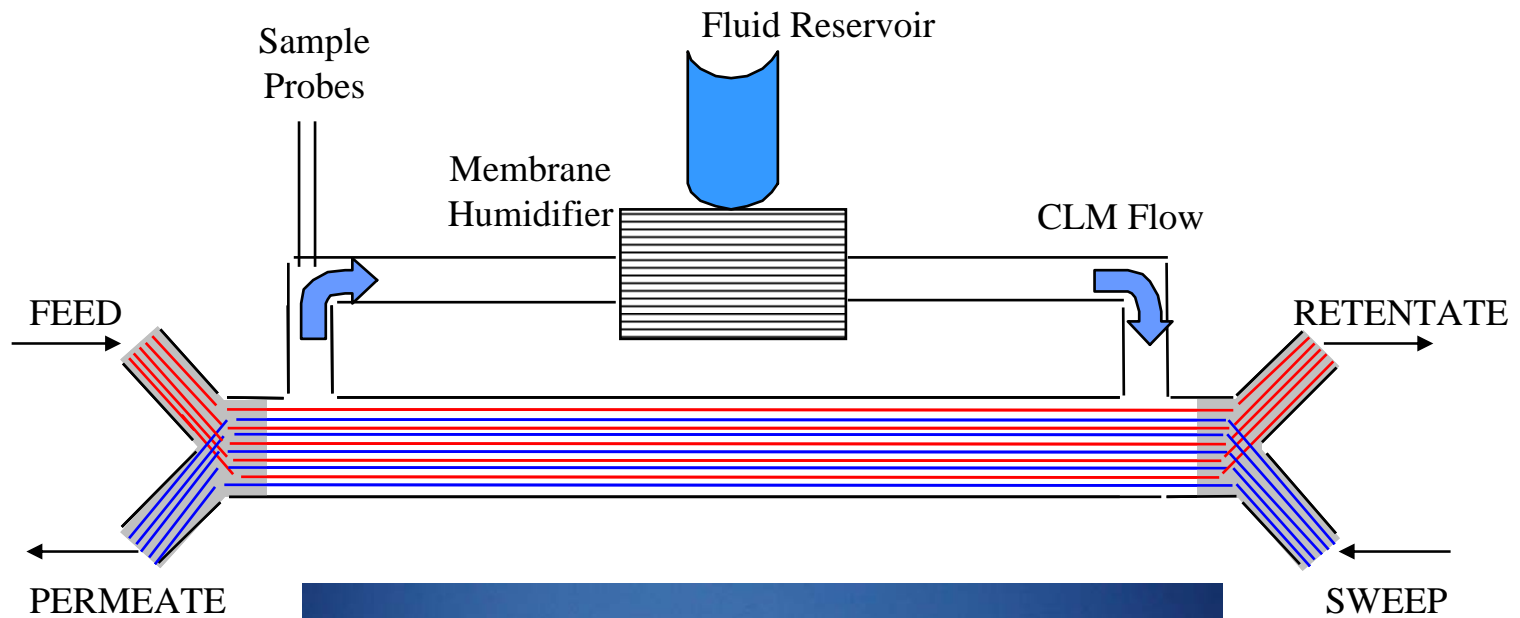
OBJECTIVES

CO₂ Capture

- Design, develop and demonstrate a highly efficient CO₂ gas separator
 - High Permeance and High Selectivity
 - Small, Lightweight, Regenerable, Low Energy
 - Suitable for a Wide Range of pCO₂
 - Stable for Long Periods

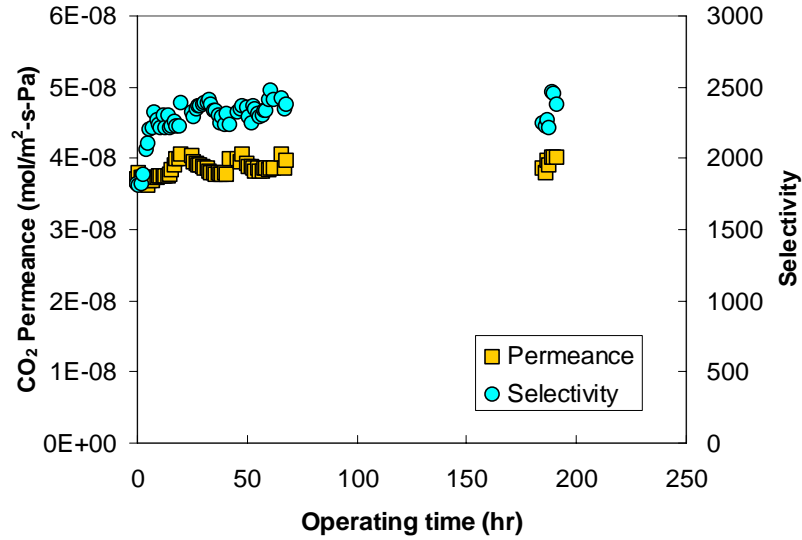


HF-EBCLM

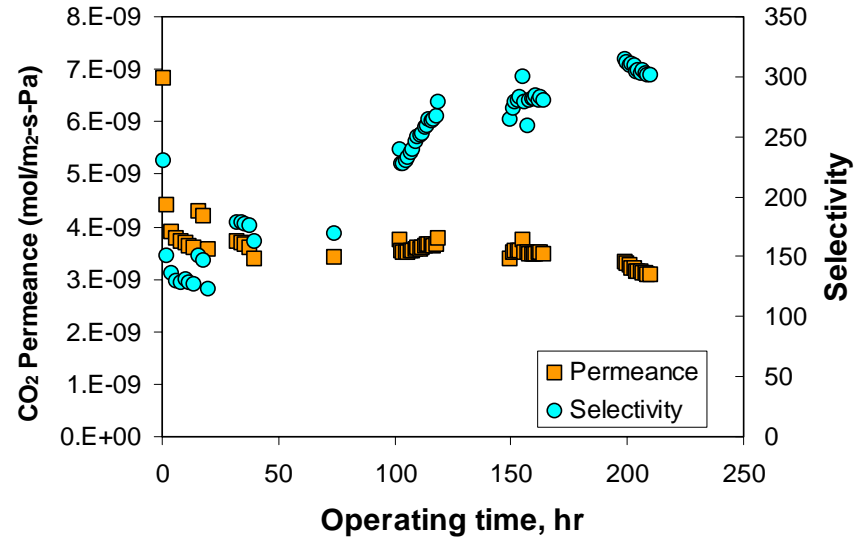


Stability and Performance

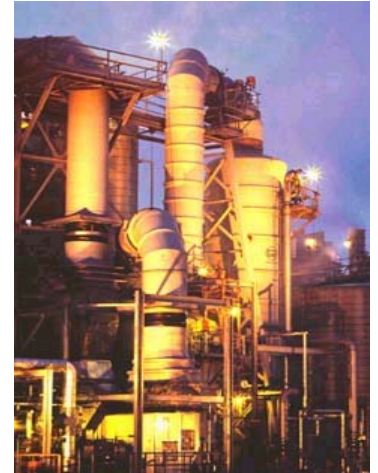
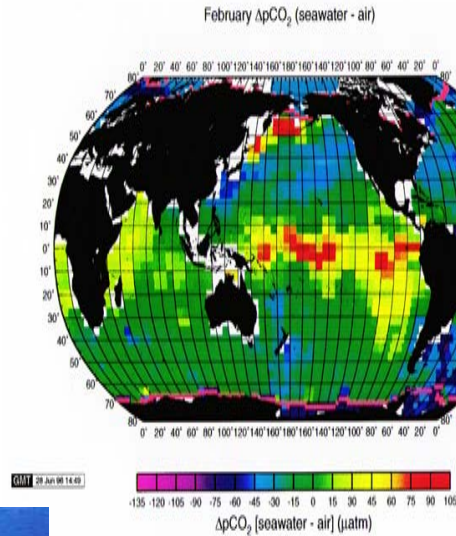
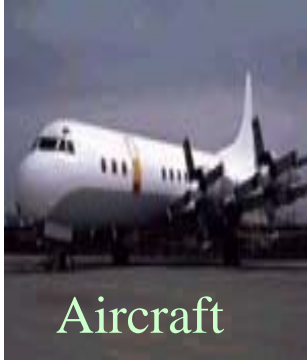
Flat Sheet



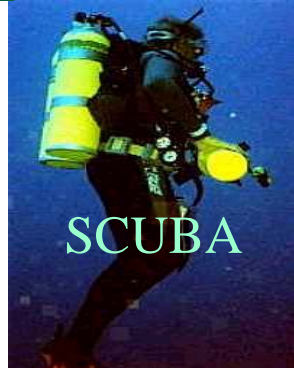
Hollow Fiber



Need to Capture CO₂



**Closed Environmental
Life Support**



**Global Warming - Global
Climate Change**

- Capture CO₂ from Air
- Capture CO₂ from Stack Gas



CO₂ uses (I)



Food Preservation, Protection and Processing

- Bulk Food Commodities
- Beverage Carbonation



Plant Growth Stimulation

- Greenhouses
- Fields
- Forests



CO₂ Uses (II)

Energy

- Enhanced Oil Recovery
- Enhanced Gas Recovery
- Enhanced Coal Bed Methane



Merchant Gas

- Low Pressure CO₂ Pre-enrichment



OBJECTIVES

CO₂ Sequestration

- Design a novel CO₂ sequestration method
 - Produce a solid carbonate or bicarbonate
 - Use readily available cation containing materials as acceptors
 - Do a trade-off study comparing total system costs vs. source advantages, i.e., stack gas vs. atmosphere
 - Dispose of product on the surface, below surface or in salt domes

Approaches

- Use HF-EBCLM to extract highly enriched CO₂ (to 90%)
- Use a single surface membrane to deliver a concentrated bicarbonate solution (up to 6.4 M)
- Test alternative methods for aqueous phase reactions
- Examine economics of alternative strategies

Conclusions

- We have developed an extremely efficient and versatile CO₂ separation/capture membrane
- It can operate over a wide range of CO₂ concentrations and yield a high concentration permeate
- We can deliver either CO₂ or bicarbonate as a feed for sequestration
- We are experimenting with several solid carbonate sequestration methods for long term CO₂ storage

Acknowledgements

- NASA Grant NAG9-1383
- DOE Grant DE-FG02-01ER86129
- NJ EcoComplex
- NJ-NSCORT
- Department of Plant Science
- Cook College
- Rutgers, The State University of New Jersey