



# Absorption and photosynthetic fixation of CO<sub>2</sub> in high alkalinity solutions

Robin Gerlach  
Professor

Chemical and Biological Engineering  
Montana State University

Collaboration with Sridhar Viamajala

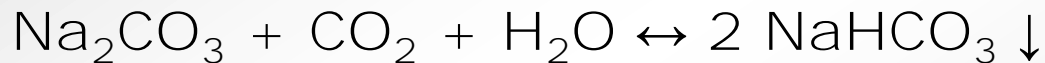


DE-EE0005993 (ASAP) - Integration of Nutrient and Water Recycling for Sustainable Algal Biorefineries

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# Motivation

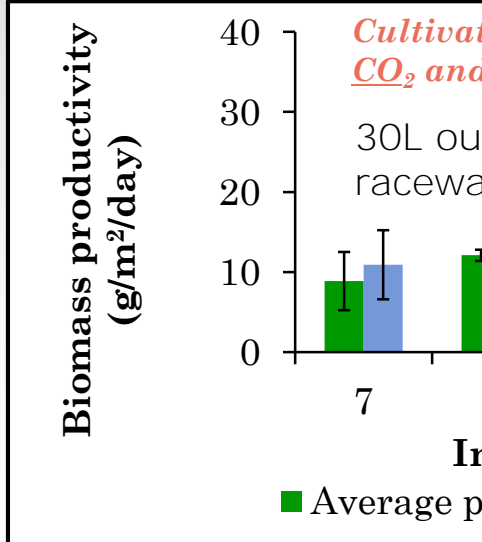
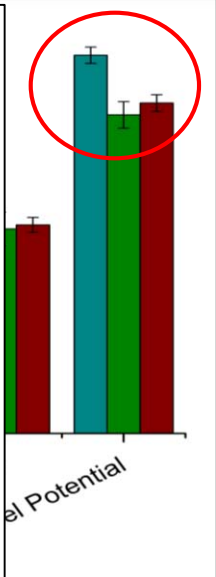
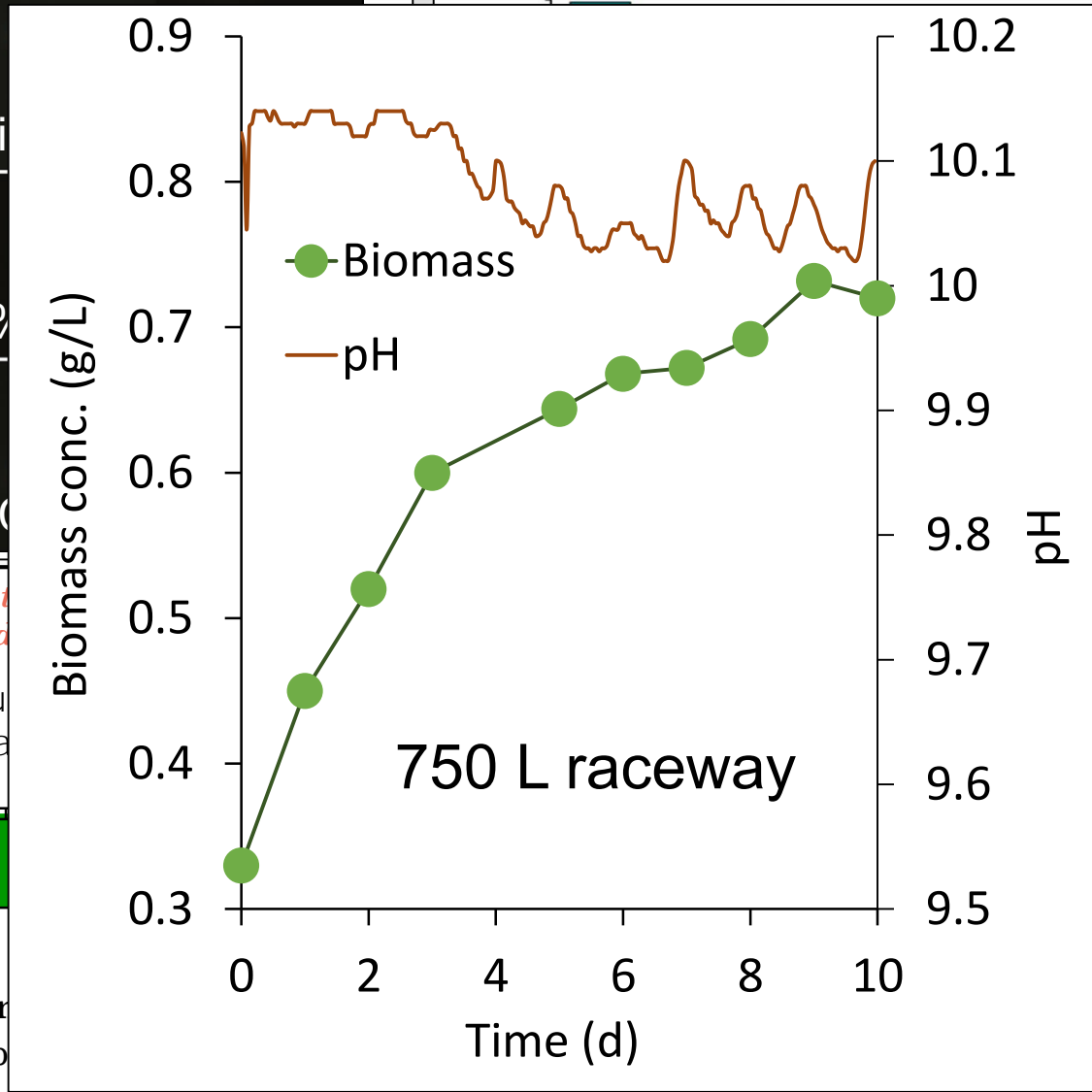
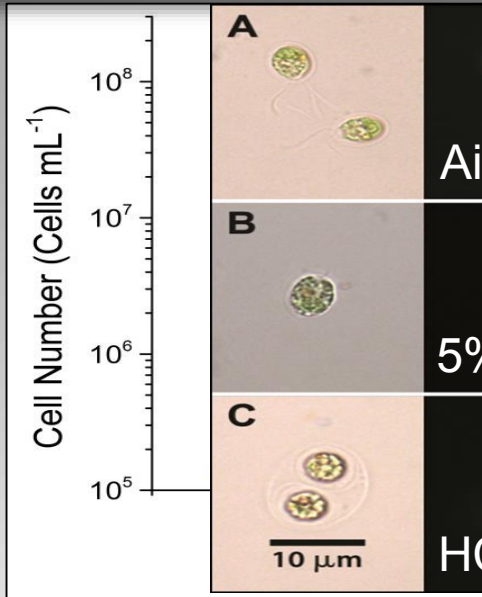
- CO<sub>2</sub> supply can be major cost factor in production of algal biomass (~\$90 out of ~\$420 per ton, Davis, R., et al. (2016) *NREL/TP-5100-64772*)
- Not always simultaneous availability of land, proper climate (light, temperature), and CO<sub>2</sub> resources.
- CCS and CCU are being considered to manage CO<sub>2</sub> emissions into the atmosphere.
- Culturing and carbon accumulation strategies based on high alkalinity have been researched and developed by us and others.
- Soda ash (Na<sub>2</sub>CO<sub>3</sub>) can be used for CO<sub>2</sub> capture



(NB: SO<sub>x</sub> can react with Na<sub>2</sub>CO<sub>3</sub> to produce sodium sulfite (Na<sub>2</sub>SO<sub>3</sub>) and sodium bisulphite (NaHSO<sub>3</sub>))

- Industrially amine-based compounds (e.g. ethanolamines [MEA, MDEA], etc.) used more commonly because of faster CO<sub>2</sub> mass transfer kinetics and lower regeneration temperatures

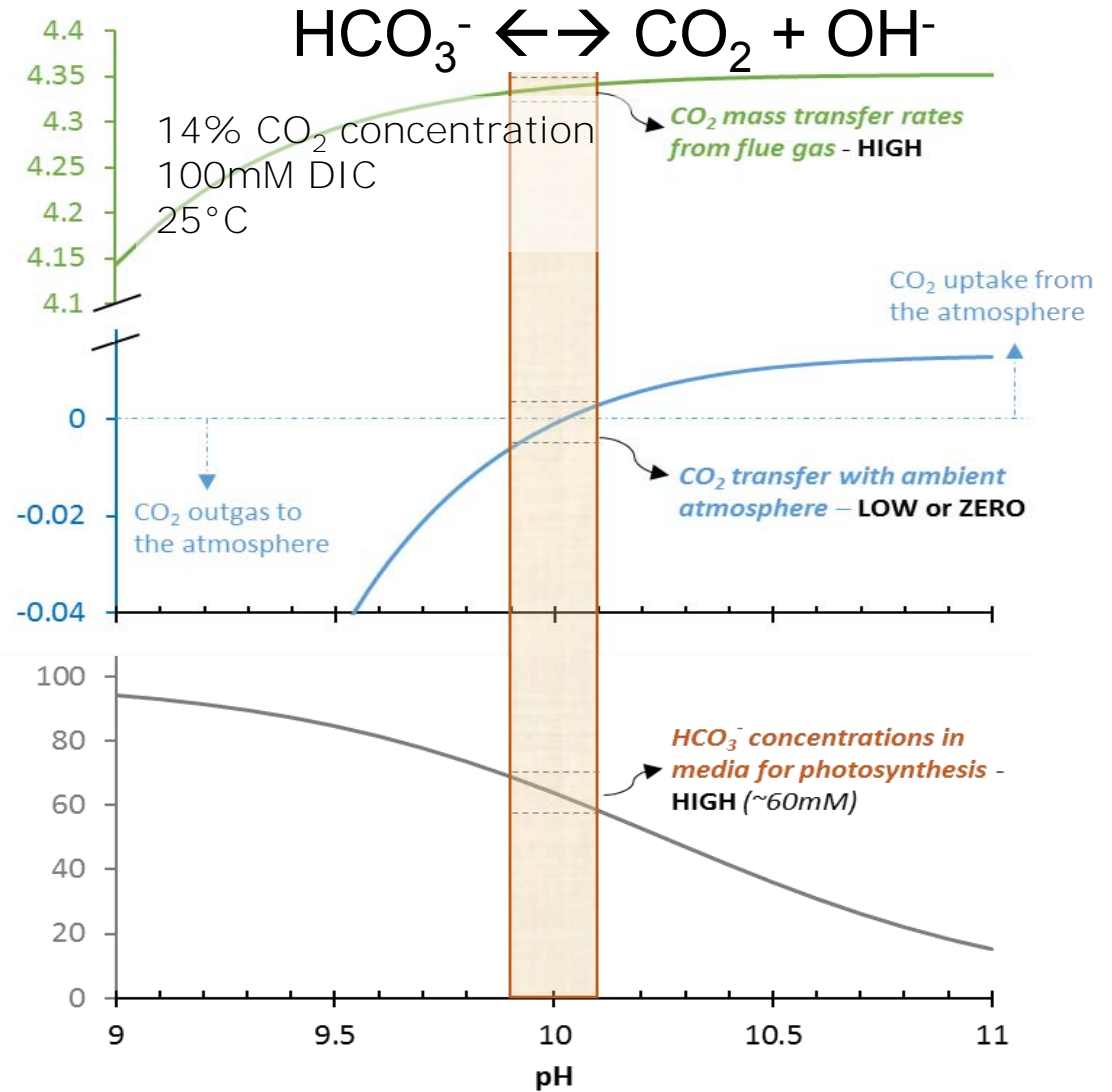
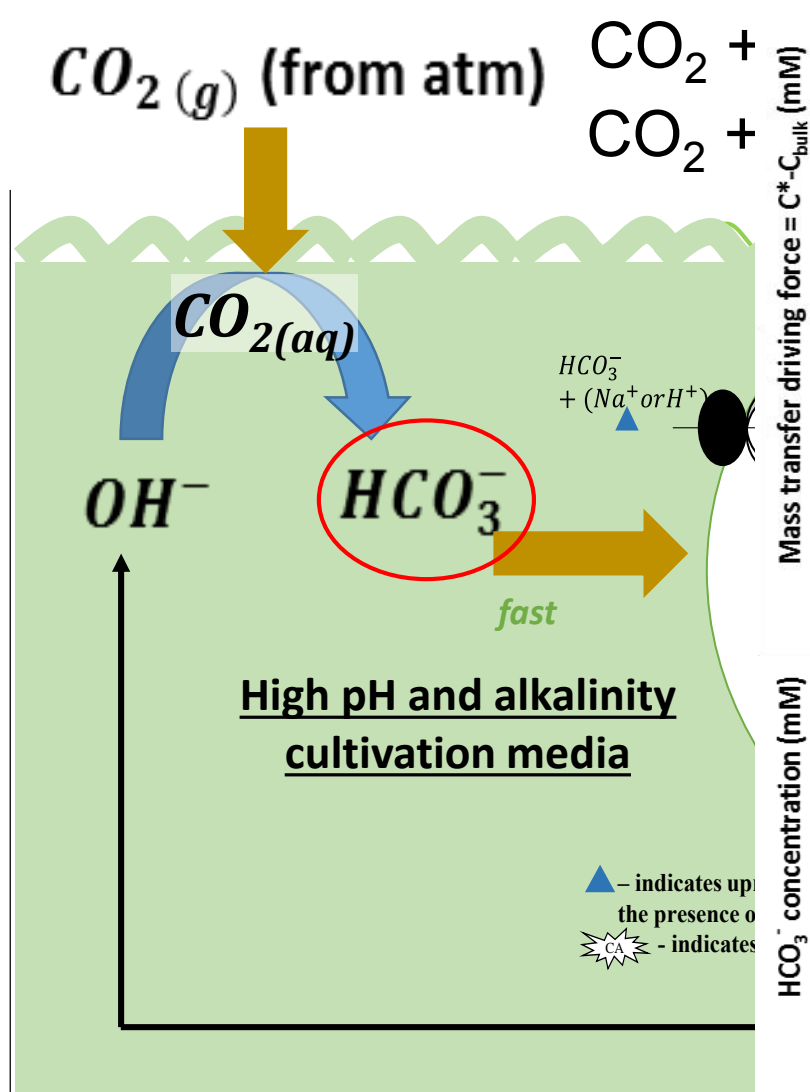
# Bicarbonate-Accelerated Algal Growth and Induced Lipid Accumulation Boost



Lohman, E. J., Gardner, R. D., Pedersen, T., Peyton, B. M., Cooksey, K. E., & Gerlach, R. (2015). Optimized Inorganic Carbon Regime for Enhanced Growth and Lipid Accumulation in *Chlorella vulgaris*. *Biotechnology for Biofuels*, 8(82), 1–13.



# Chemically Enhanced Mass Transfer of CO<sub>2</sub> at high pH values



# Publications and References

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