Aqueous CYAN Update

Topics:

- Dirty Air Stone
- Homemade EC probe
- Another Cyan run using EC probe

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August 2, 2021

Aqueous CYAN Basics

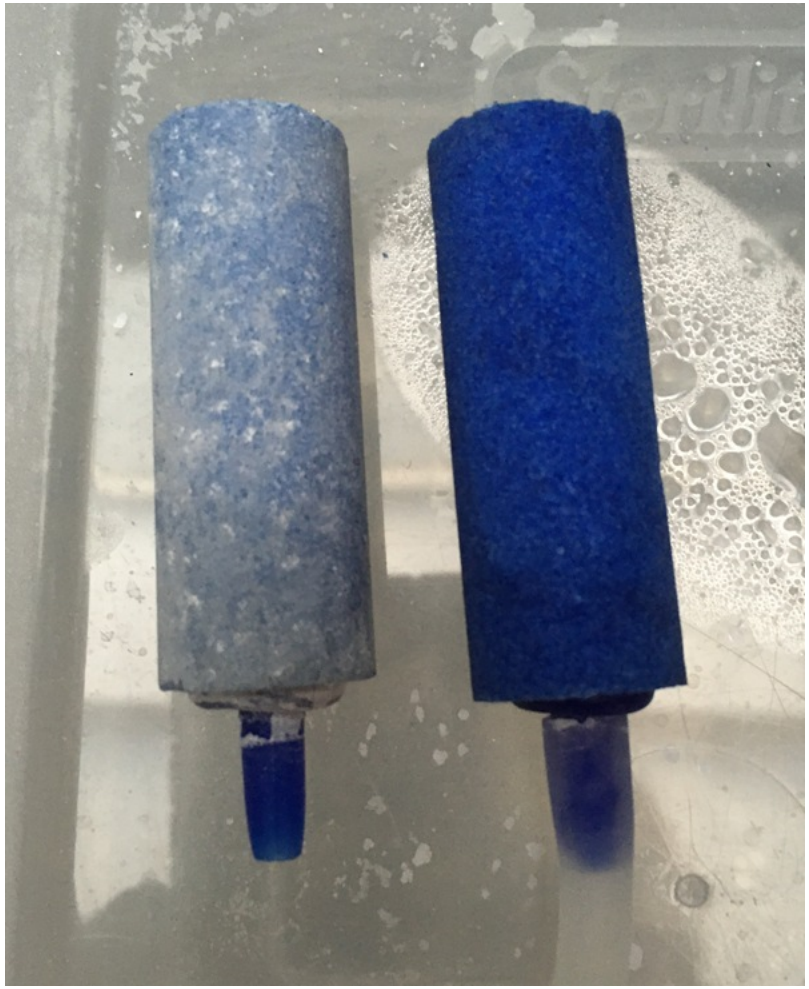
(Updated from July 9 Report)

- Same reaction as Classic CYAN:

  $Ca(OH)2 + CO2 \rightarrow CaCO3 + H2O$
- Parts reuse: Aquarium pump, air stone, chemicals, soda bottle
- Newer: Electrical Conductivity (EC) Monitoring

New Issue: Dirty Air Stone

OLD NEW

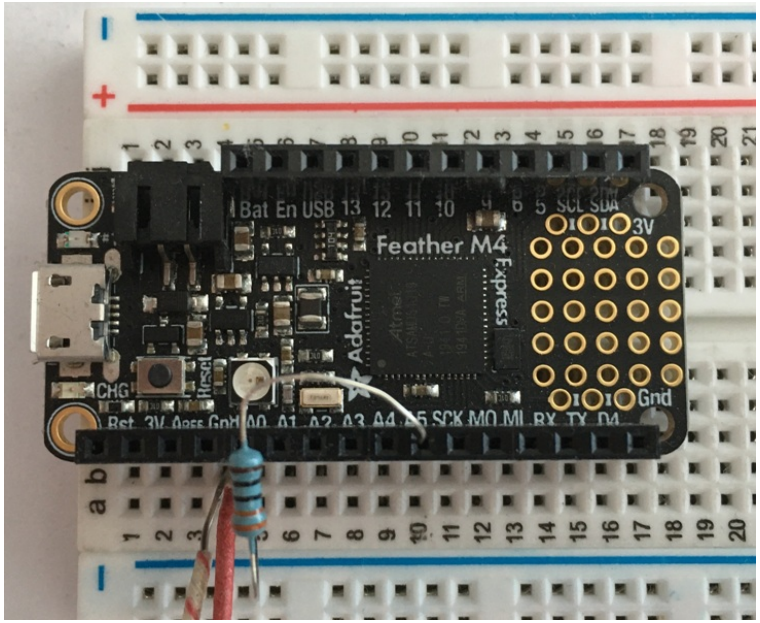


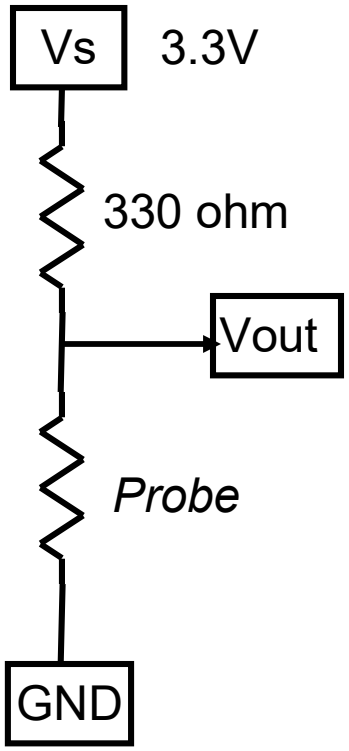
OLD NEW

EC Measurement

https://hackaday.io/project/7008-fly-wars-a-hackers-solution-to-world-hunger/log/24646-three-dollar-ec-ppm-meter-arduino

- Probe: 2 wires, 2 buttons
- Circuit: voltage divider and uC
- PULSED measurement required
- OMIT temperature adjustment





Han's Paper

Carbon Dioxide Capture Using Calcium Hydroxide Aqueous Solution as the Absorbent

Sang-Jun Han, Miran Yoo, Dong-Woo Kim, and Jung-Ho Wee*

Department of Environmental Engineering, The Catholic University of Korea, 43-1, Yeokgok 2-dong, Wonmi-gu, Bucheon-si, Gyeonggi-do 420-743, Republic of Korea

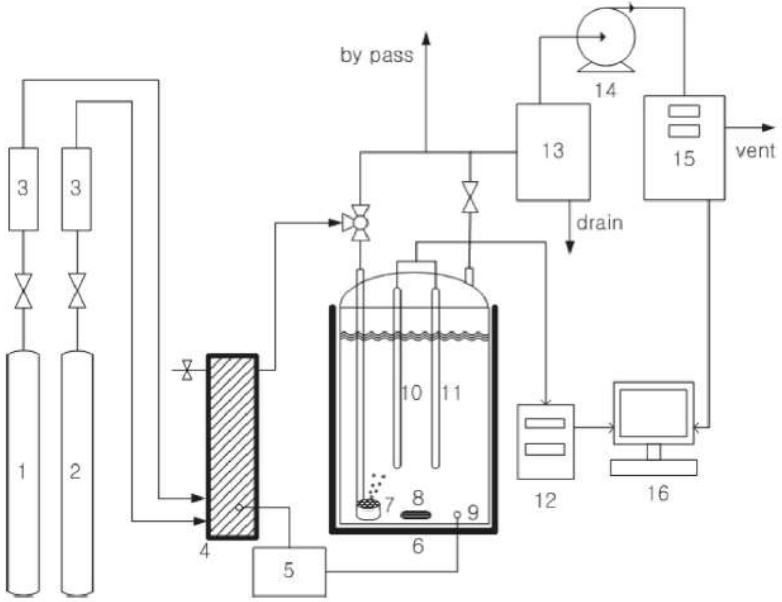


Figure 1. Schematic diagram for a CO_2-capture system using $Ca(OH)_2$ aqueous solution as the absorbent: (1) N_2 cylinder, (2) CO_2 cylinder, (3) MFC, (4) gas mixer, (5) temperature controller, (6) Pyrex reactor, (7) sparser, (8) magnetic stirrer, (9) thermometer, (10) pH sensor, (11) EC sensor, (12) pH/EC meter, (13) dehumidifier, (14) sampling pump, (15) gas analyzer, and (16) computer for data acquisition.

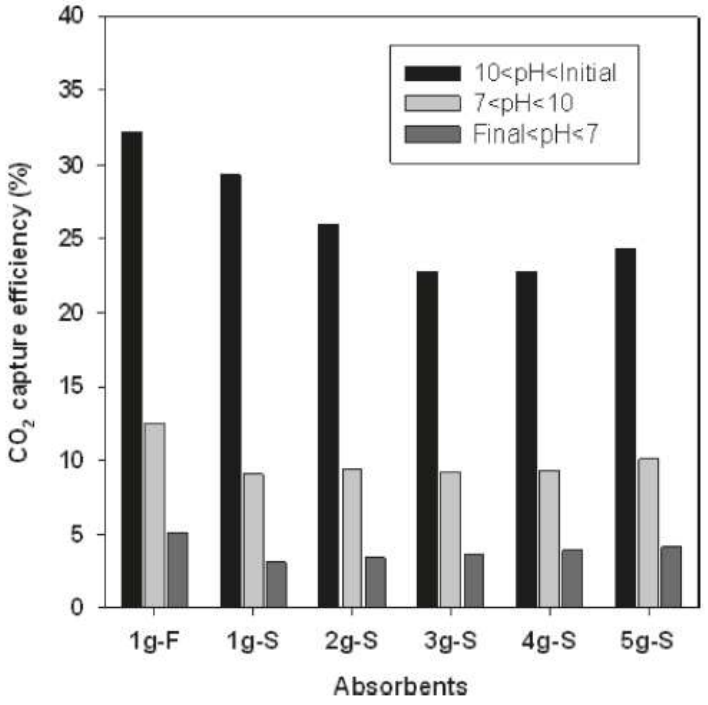
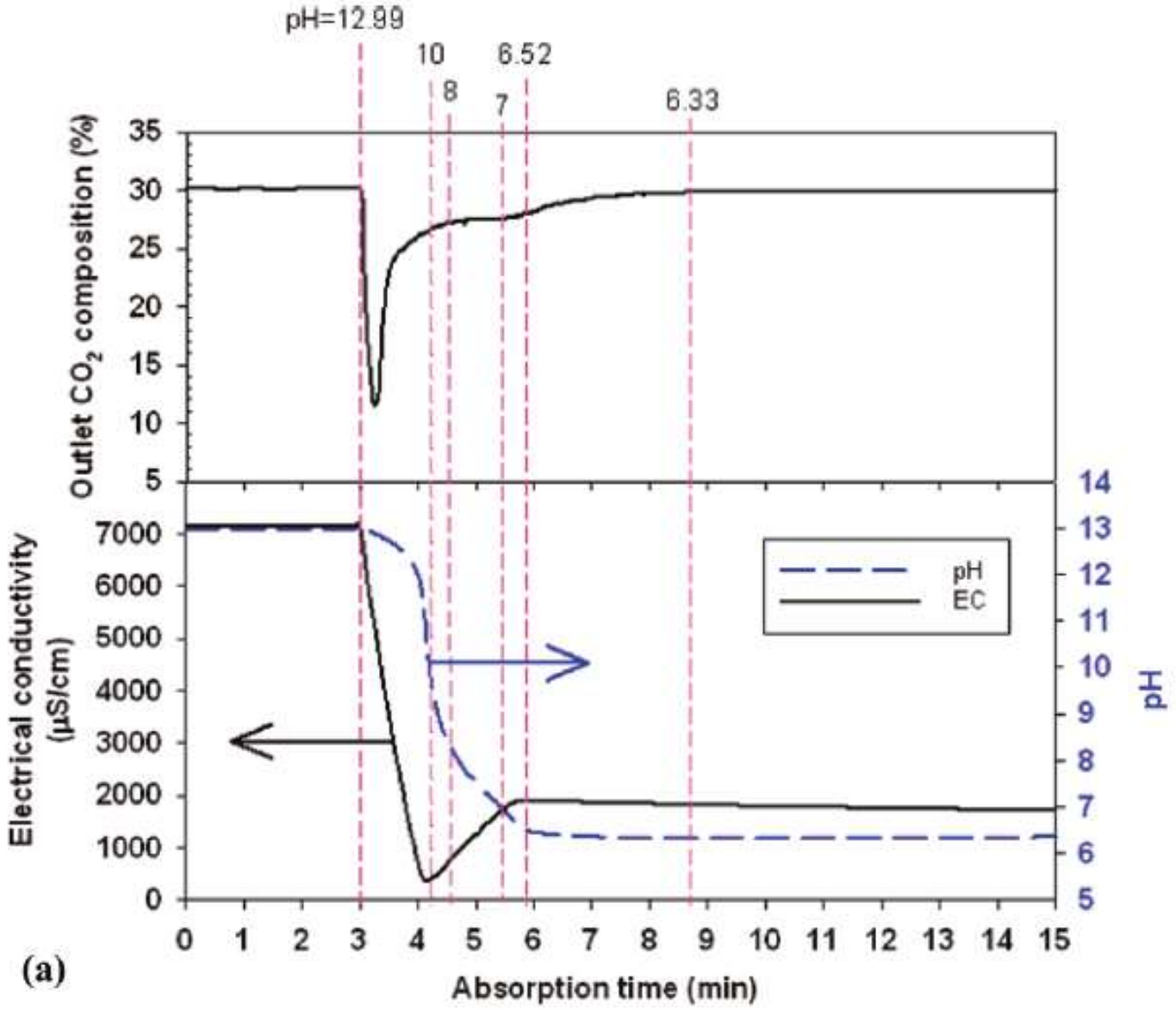


Figure 11. CO_2-capture efficiencies of each absorbent in the pH ranges.

dx.doi.org/10.1021/ef200415p | *Energy Fuels* 2011, 25, 3825–3834

Han Paper Detail

Saturated Ca(OH)2 solution

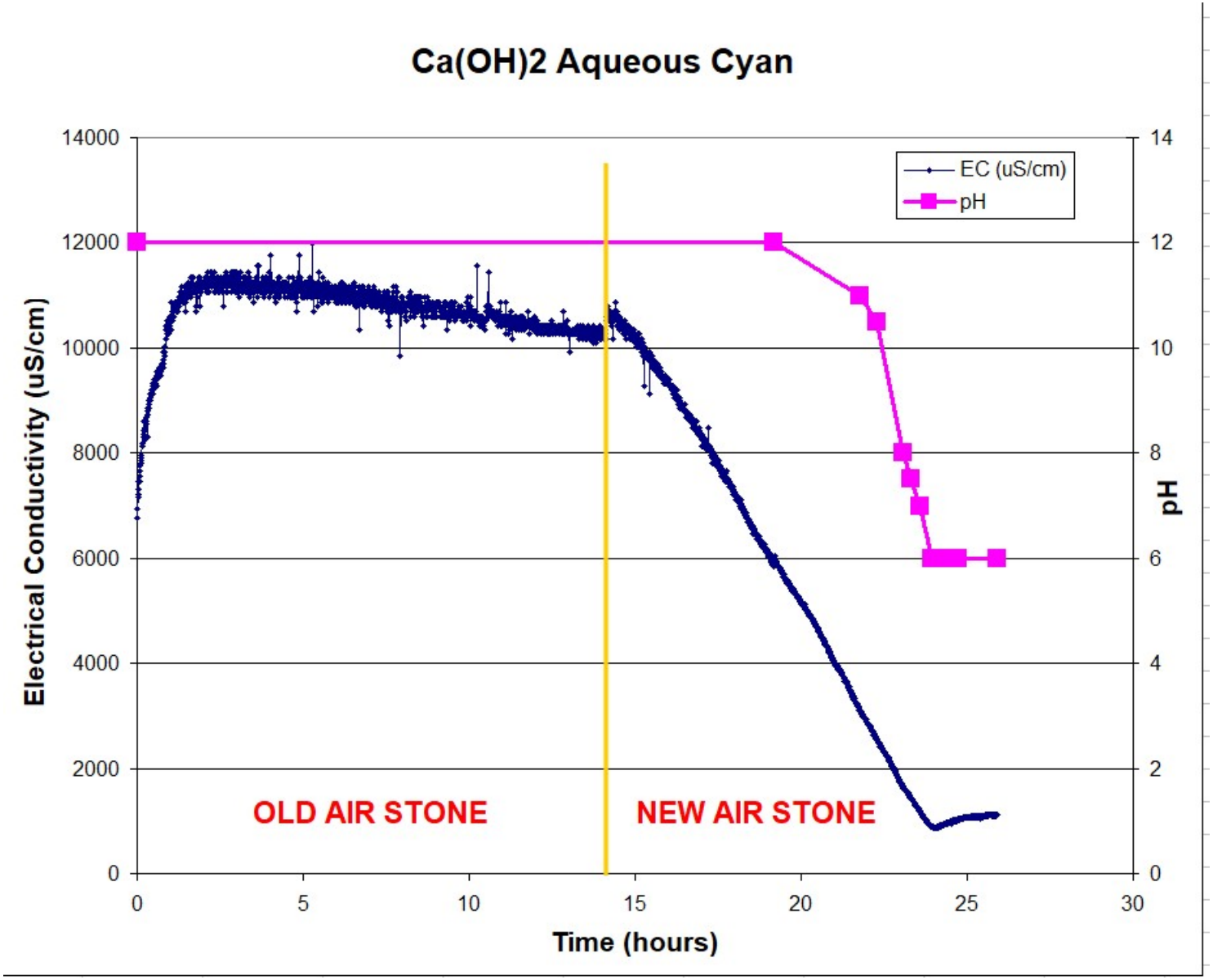


Newest Experiment

- 1g $Ca(OH)_2$ in 1L water. Solubility of $Ca(OH)_2$ in H2O: 1.73 g/L at 20C. [Same as last week]
- Calibration of EC probe: estimate 8000uS/cm (*) in our solution
- Pumped air through air stone (bubbler), while measuring EC every 30 seconds.
- Periodically measured pH (with paper).
- Kept going until EC and pH flattened out

•Note on units: S ≡ Siemens ≡ mho ≡ 1/ohm
•It is /cm because it's a spatially distributed resitance

Results


Ca(OH)2 Aqueous Cyan
EC (uS/cm)
pH
Electrical Conductivity (uS/cm)
pH
Time (hours)
OLD AIR STONE
NEW AIR STONE
14000
12000
10000
8000
6000
4000
2000
0
14
12
10
8
6
4
2
0
0
5
10
15
20
25
30

For Followup

- Understand overshoot in EC at start.
- Better air stone (sparger) needed? Or keep, but clean or dispose.
- Ideas for automating end of process:
  - Electronic pH meter ($$)
  - Electronic resistivity measurement ($)
- Need to pump more air
- Distilled water? Purer sorbent?
- How to separate and dry precipitate?