Initial set up for DM Alkaline CO_2 Electrolyzer Cell

- System set up (recommended)
  Typically, the system setup uses a peristaltic pump to circulate a 10mM $KHCO_3$ aqueous solution (from the reservoir) into the anode chamber at flowrate of 3 mL/min. The suggested tubing used is a 1/8" OD, 1/16" ID PTFE tubing. Pure CO_2 from cylinder is humidified with water using a bottle humidifier (sold separately) and then fed to the cathode chamber at a flow rate of 30 sccm.
- Fluid Connections
  i) Cathode: remove the nuts from compression tubing and remove black rubber rod from the nut, connect the tubing (PTFE, 1/8"OD) from CO2 humidifier to the compression fitting at the top of cathode (stainless steel flow field); connect another tubing (PTFE, 1/8" OD)to the compression fitting at the bottom of cathode, route to the catholyte collector and then to THE EXHAUST. Please note that CO is poisonous, so please do not emit or release the cathode product gas into lab or working area.
  ii) Anode: Remove the nuts from the compression fittings and remove the black rubber rod from the nut. Then push the tubing from the pumptubing 1/8" (OD) PTFE through the nuts, turn the nuts with tubing inside onto the compression fitting at the bottom. Connect another tubing (1/8" OD, PTFE) to the compression fitting at the top, and route back the the anolyte reservoir. Tighten the nuts with finger only.
- Power Connections
  Locate the threaded hole for wire connection on top of the cell (smaller through-hole 8-32 thread). Then connect the ring terminal with the Phillips round head screw (#8). Use this same procedure for both anode and cathode.

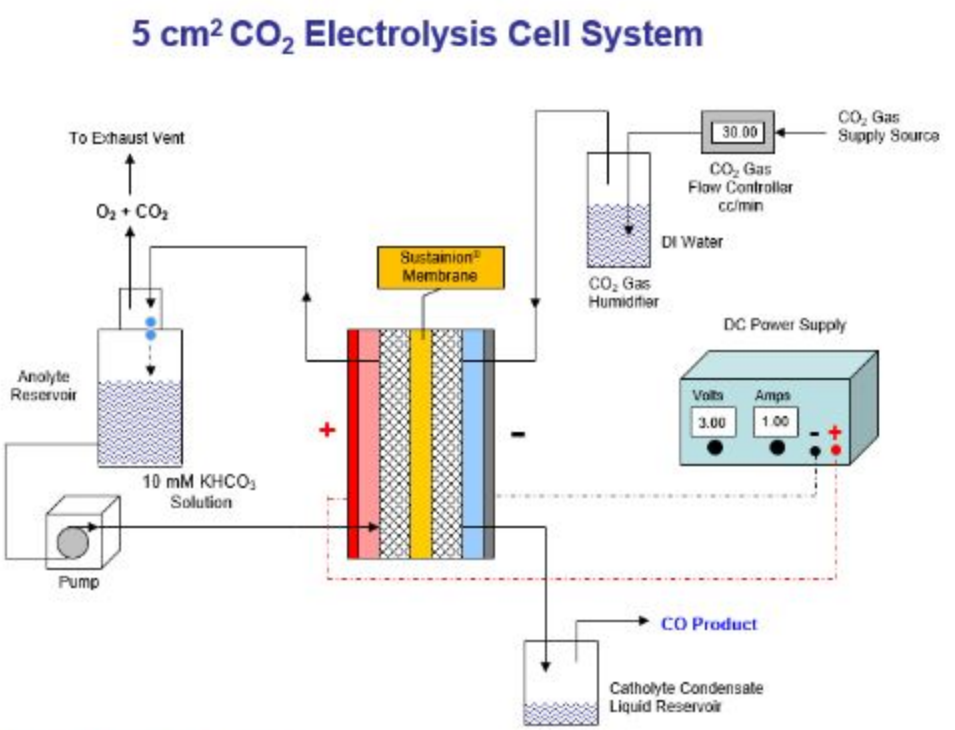

Figure 1. The electrolyzer setup

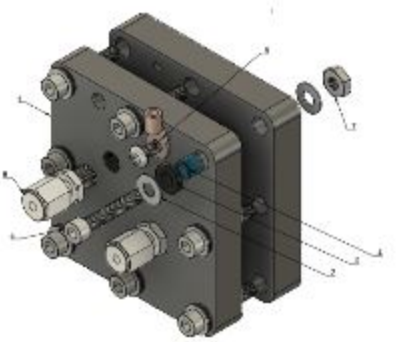

Figure 2. Diagram of the 5 cm^2 cell

Cell Testing and Operation

Begin pumping a 10mM $KHCO_3$ aqueous solution from reservoir at a rate of 3 mL/min to the inlet (at the bottom) of the anode chamber and feeding CO_2 through a bottle humidifier to the inlet (at the top) of the cathode chamber. Connect the anode electrical lead (red) and cathode lead (black) to the positive and negative connections, respectively, on the power supply with electric wires/cables (not included). Set the power supply voltage at 3-3.2V and slowly begin increasing the current to a setting of 1 A (0.2A/cm<sup<2). The cell current will reach the desired 1A in a few min or hours depending on the cell membrane and electrode conditioning. Testing can also be done with potentiostat, but the connections depend on the testing protocol.