

Technical Bulletin # 52

To: Coulometrics Support Personnel

From: Applications/Engineering Dept.

Date: February 10, 2004

Subject: Assembly Procedure for the CM210-026 Simultaneous C/S Cell Assembly.

DESCRIPTION

The CM210-026, Simultaneous C/S Sulfur Cell Assembly, is a special "air-tight" cell used in conjunction with UIC Models CM5014, CM5014S and CM5130 for the simultaneous determination of CO₂ and H₂S in amine scrubbing solutions.

It is comprised of a cell with threaded anode and cathode compartments, threaded nylon anode and cathode tops with o-ring seals, a gas dispersion tube inlet, a pressure equalization tube, a dual platinum detector electrode, two platinum working electrodes, a stir bar, and a Teflon outlet tube. It is important to note that the cells and cell tops are matched sets and cannot be interchanged. However, the electrodes, dispersion tube and Teflon tubing may be used with other cells.

The air-tight nature of the cell prevents sample gas loss and ensures complete transfer of the sample gas to the CM5014 carbon coulometer cell.

ASSEMBLY

Refer to Figure 2 for proper component placement and descriptions. For easiest assembly please follow this procedure in order (some assembly may already be completed at the factory and therefore some steps may not be necessary):

1. **Detector Electrode** – Refer to Figure 1 at right. Slip the electrode through the top of the white, plastic nut. Next slide on the slip ring with the narrow tapered portion towards the top of the electrode. Slide the o-ring on. Slide on the ferrule with the wider portion towards the top of the electrode. Slip the threaded connector on with the finer threads towards the top of the electrode. Slide the whole assembly together and position the detector electrode so that the black plastic portion of the electrode top is about 1/8 – 1/4 inch above the nut. Finger tighten the nut onto the threaded connector. Wrap the coarse threaded portion of the connector well with Teflon tape (*it may also be desirable to apply some vacuum grease to the wrapped threads*). Screw the threaded connector into the large hole on the threaded anode compartment cap until the white nut is about 1/8 – 1/4 inch above the surface of the cap.
2. **Dispersion Tube** – Slide the top of the dispersion tube up through the bottom of the threaded anode compartment cap. Slide the 7mm ferrule over the top of the dispersion tube with the wider, flat portion of the ferrule facing the cap. Wrap the threads of the 5/16 inch black, plastic connector with Teflon tape. Slide the plastic connector over the top of the dispersion tube. Screw the connector into the anode compartment top and finger tighten. When assembled, the bottom of the dispersion tube should be

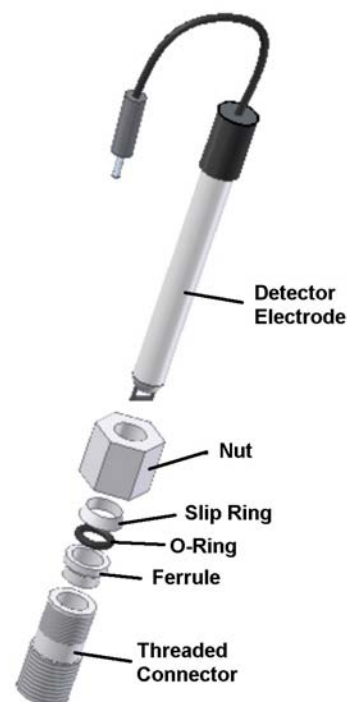


Figure 1
Detector Electrode Assembly

- about 3/8 – 1/2 inch above the bottom of the coulometer cell.
3. **Working Electrode** (with red plug) – Wrap the threads of the 1/4 inch black, plastic connector with Teflon tape. Slide the connector onto the electrode with the threads toward the coiled platinum end. Slide on the 1/4 inch ferrule with the wider, flat portion toward the coiled end. Slide the coiled end of the electrode through the top of the anode compartment cap. Screw the connector into the cap and finger tighten. When assembled the coiled end should be about 1/2 inch above the bottom of the coulometer cell.
 4. **Cell Outlet Tube** (with red, luer connector) – Wrap the threads of a tan, 1/8 inch connector with Teflon tape. Slide the free end of the Teflon outlet tube through the top of the connector. Slide a 1/8 inch ferrule onto the tube with the wider, flat portion of the ferrule toward the bottom of the tube. Leave about 1/2 – 3/4 inches of tubing past the ferrule. Screw the connector into the anode compartment top and finger tighten.
 5. **Pressure Equalization Tube** – Flare one end of a 6 inch piece of Teflon tubing using heat and a small, metal awl. Slide the unflared end of tubing up through the small hole at the bottom of the threaded cathode compartment cap. Wrap the threads of a tan, 1/8 inch connector with Teflon tape. Slide the unflared end of the Teflon tube through the top of the connector. Slide a 1/8 inch ferrule onto the tube with the wider, flat portion of the ferrule toward the bottom of the tube. Leave about 1/4 inch of tubing past the ferrule. Gently pull the flared end of the tubing into the small hole until it feels snug.
 6. **Working Electrode** (with black banana plug) - Wrap the threads of the 1/4 inch black, plastic connector with Teflon tape. Slide the connector onto the electrode with the threads toward the coiled platinum end. Slide on the 1/4 inch ferrule with the wider, flat portion toward the coiled end. Slide the coiled end of the electrode through the top of the cathode compartment cap. Screw the connector into the cap and finger tighten. When assembled the coiled end should be about 1/2 inch above the bottom of the coulometer cell side arm.
 7. **Anode Compartment Cap** – Place a 1 – 1 1/2 inch stir bar into the anode compartment of the cell. Screw the assembled anode compartment cap into the coulometer cell. When assembled the detector electrode should be opposite and parallel to the frit and the working electrode should be next to the frit. Secure a small union to the top of the dispersion tube and insert the free end of the cell inlet tube into the top of the small union.
 8. **Cathode Compartment Cap** – Screw the assembled cathode compartment cap into the side arm of the coulometer cell. When assembled the pressure equalization tube should be in line with it's corresponding hole in the anode compartment top. Screw the tan connector into the anode compartment top and finger tighten.

The cell is now fully assembled and should resemble Figure 2 on the next page.

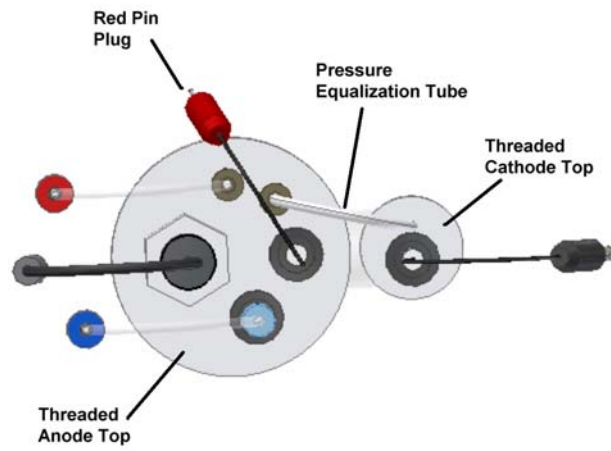
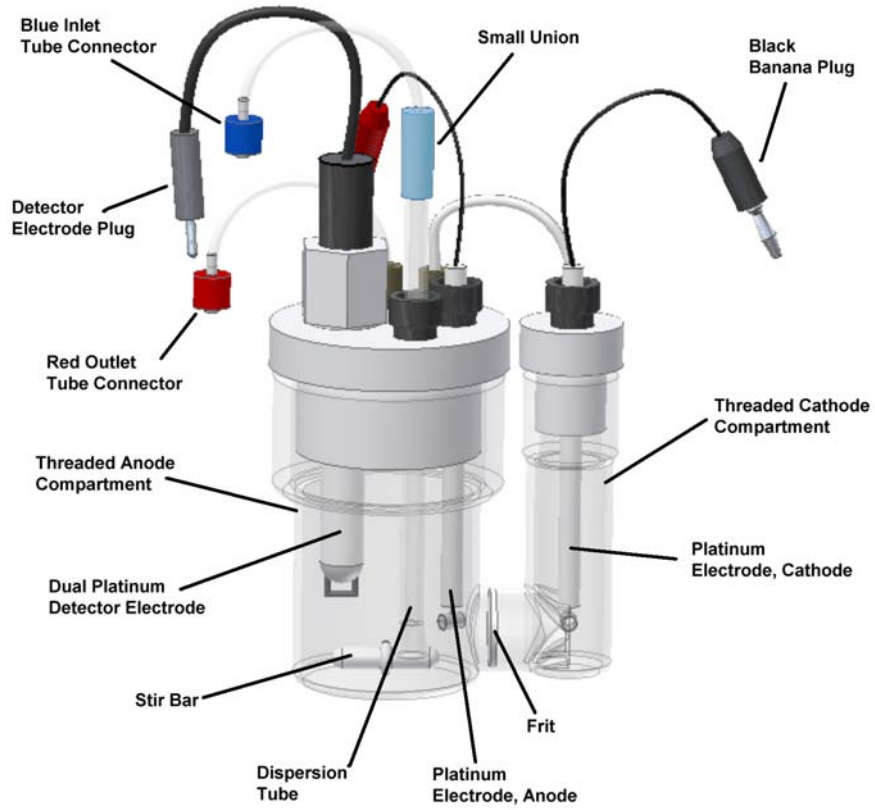


Figure 2
Assembled Coulometer Cell

LEAK CHECKING

The assembled cell may be leak checked in two ways. Connect a carrier gas source to the dispersion tube inlet. The carrier gas source may be from the CM5130 Acidification Module or a pressurized gas cylinder regulated from 2-5 psi. Next, plug the cell outlet fitting using a small union and a pinch clamp. If using the CM5130 as the carrier gas source, observe the ball in the flow module. The ball should drop from the initial set point of 100 ml/min to 0 ml/min within a couple of minutes. If the ball does not drop to 0 ml/min this is an indication of a leak in the system.

To find the leak, or if you are using a pressurized gas cylinder that is not connected to a flow module, dunk the pressurized cell into a 4L beaker partially filled with water. The water level should be high enough to cover all of the connections on the cell. Alternatively, a product such as "Snoop" can be used around all of the connections. Bubbles will indicate where the leak is occurring. Leaks can be fixed with either additional tightening of the fittings or the addition of Teflon tape and/or vacuum grease.

CELL FILLING

With the anode and cathode tops removed, place 100-125ml of Sulfur Anode solution (UIC Part# CM300-026) in the anode compartment. Fill the cathode compartment to a level that is equal to or slightly less than the anode level with Sulfur Cathode solution (UIC Part# CM300-027). Place the stir bar into the anode compartment and replace the screw on anode and cathode tops.

CELL CLEANING AND MAINTENANCE

Refer to the CM5014S Operation Manual, Section 6, pages 17 and 18.