

NovaMea AEM Cell Assembly Instructions

Preparations of Materials

1. Materials required: Single cell hardware - anodic and cathodic end plate (functioning also as current collector and flow field control), bolts and washers; Membrane electrode assembly - Anode (An) /Membrane (AEM) /Cathode (Ca) ; Sealing gaskets (GK) - of PTFE or of other sealing materials; Torque wrench: 1-20 N·m (resolution 0.1 N·m), 5M/ 6M screws and nuts; Universal adapter. The components of AEM electrolyzer are shown in Figure 1. The end plates of the electrolyzer are shown in detail, as well as the inlet and outlet fluid joints, anode and cathode electrodes, insulation screws and gaskets.

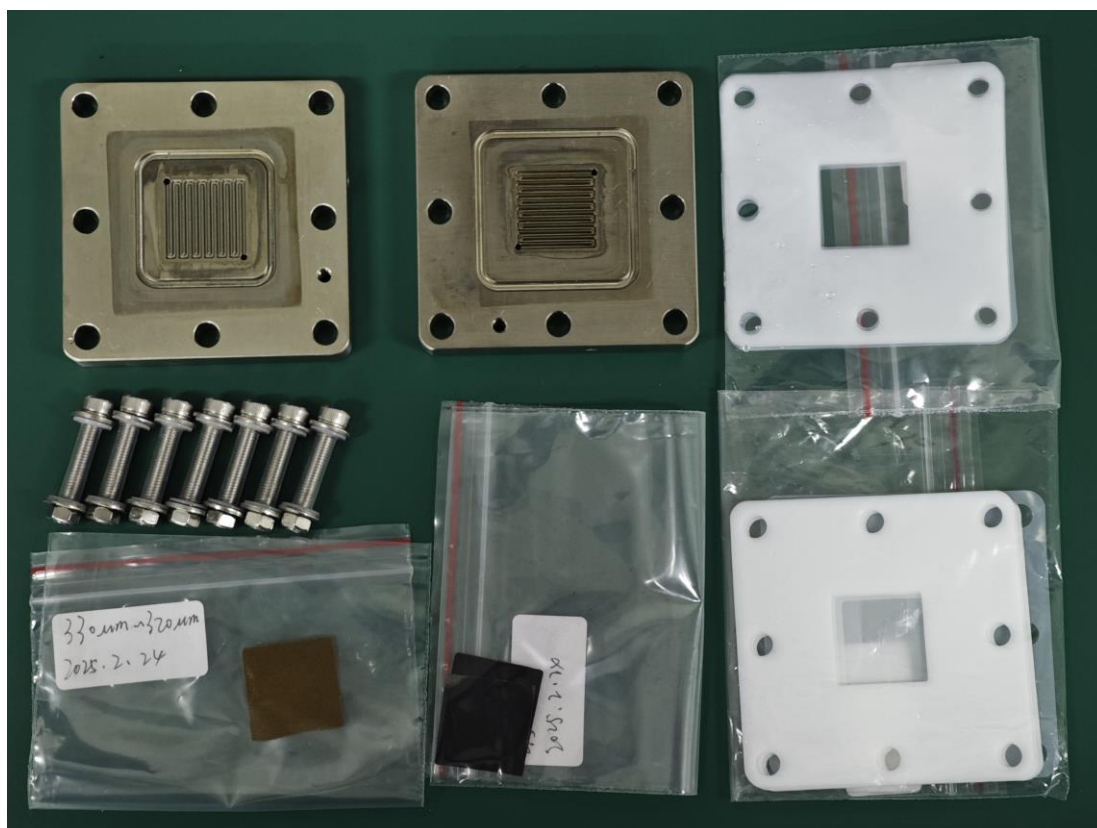


Figure 1. 5cm² electrolytic cell components

2. Preparation:

Cut AEM and electrodes. Cell is normally run with an active area of 4 cm². AEM should be approximately 5 x 5 cm. Electrodes should be 2.2 x 2.2 cm.

Cut Gaskets. Cathode gasket (window size 22.5 x 22.5 mm, 125 um thick for 190um carbon paper, 300 um thick for 400 um carbon paper); Anode subgasket (window size 20 x 20 mm, 50 um thick); Anode gasket (22.5 x 22.5 mm, 200 um thick for 0.3 um Ni foam, 250 um thick for 0.4 um Ni felt, 125 um thick for 250 um Ni felt).

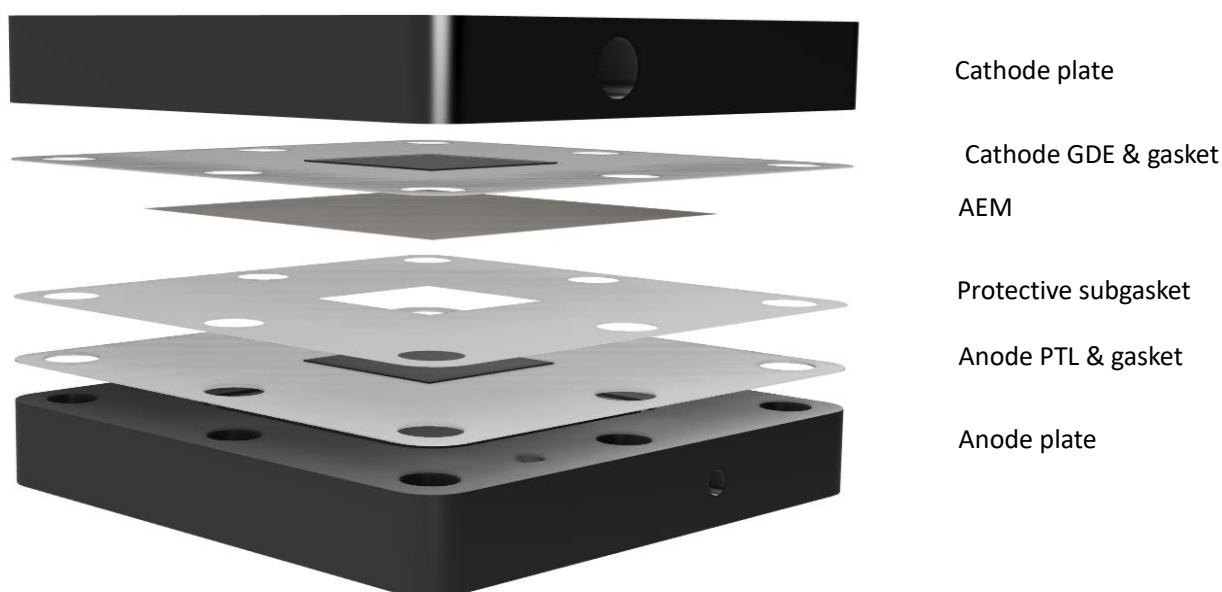


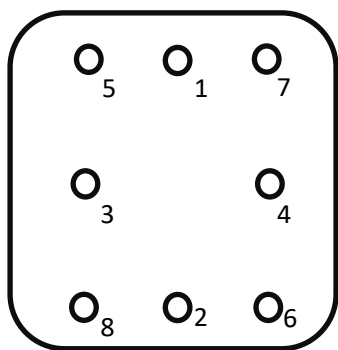
Figure 2. assembly of the cell

3. Pretreatment of materials: Exchange the membrane and cathode (float face-down with catalytic layer toward solution) in 30-50ml of 1 M KOH for one hour. Repeat 2 more times, exchanging the solution with fresh KOH after each time. The anode can be wetted with 1 M KOH before assembling the cell.

Installation process

1. Place the anode plate on a stand with the flow field facing up.

2. Place the anode PTL on the anode flow field.
3. Place the anode PTFE gasket around the anode. Make sure the electrode and gasket do not overlap.
4. Place an additional 50 μm -thick gasket (protective subgasket) with a smaller (20 x 20 mm) window on top, such that the edges of the anode PTL are covered.
5. Place the AEM on top of the anode and gaskets.
6. Place a cathode gasket on top of the AEM.
7. Place the cathode GDE on top of the membrane, catalyst side down. Make sure the GDE and gasket do not overlap.
8. Place the cathode end plate on top of the cathode GDE and gasket. The holes for the heating cartridges should be on opposite sides.
9. Keeping the cell horizontal, place all bolts into the holes. Attach a plastic washer, metallic washer and nut at the end of each bolt and hand tighten.
10. Tighten bolts to 0.5 N-m, then 2.5 Nm using torque wrench. This should be done in a star pattern as shown below. Complete the tightening pattern twice at 2.5 Nm to verify that all bolts are at the correct torque.



11. Connect cell in test setup, including thermocouple (on the cathode side), heating rods, power supply wires, and tubes for fluid transfer. Remote sensing (voltage compensation) wires should be attached to the cell in parallel with the main power supply wires. Anodic solution should be fed from the bottom and removed from the top. The top fitting on the cathode should be blocked if running in dry cathode mode. Cathode outlet should be on the bottom.

Running the cell

1. Feed 1 M KOH to anode side at the desired flow rate (10 ml/min recommended).
2. Heat cell to desired temperature once solution has reached the cell (60-80 °C).
3. After cell has reached desired temperature, apply the following program with the power supply:
 - a. 0.25 A/cm² (2 min)
 - b. 0.5 A/cm² (2 min)
 - c. 0.75 A/cm² (2 min)
 - d. 1 A/cm² (2 min + desired hold time)
4. After running for 1 day, replace the electrolyte with fresh 1 M KOH.