

FuelCell Addendum – Reformate and Gas Mixing Setup

Q: Can I setup my Scribner fuel cell test system (850/855/890) and FuelCell software for gas mixing? I want make mixtures of different oxygen (O₂) and nitrogen (N₂) concentration for mass transport limiting experiments.

A: The FuelCell software manual has information on setting up gas mixing under the heading "Reformate Simulation". There is a "Reformate" tab in the Instrument Configuration menu. This is where you setup FuelCell for additional mass flow controllers, gas type and concentration for gas mixing. Once the Reformate tab is configured, the Setup Fuel menu will now show the additional available gases.

In this example, the main cathode gas is Air (21% O₂ + 79% N₂) and there an additional 1 SLM flow controller connected to a tank of pure N₂ (1E6 PPM concentration). The Simulator Type is set to Internal. For this application it is helpful to set the Concentration Display Units to Percent.

Setup Instrument

NOTICE: DO NOT MAKE CHANGES TO THIS SCREEN WITHOUT CONSULTING THE FUELCELL MANUALS!
All Configuration parameters are described in "Chapter 11 - Instrument Configuration" of the FuelCell Manual as well as in the Online Help.

Temp. Follower	Impedance / Potentiostat	Data Expansion (Option 892)
Fuel Configuration	Auto MultiGas	Reformate
	System Configuration	Alarms

Simulator Type: Internal

Main Anode Gas Name: H2 Main Cathode Gas Name: Air

Tank 1:

Cathode	Tank Name: N2	Controller (Liters/Minute): 1
	Gas Name: N2	Gas Concentration (PPM): 1E6

Tank 2:

Anode	Tank Name: N/A	Controller (Liters/Minute): 0
	Gas Name: N/A	Gas Concentration (PPM): 0

Tank 3:

Anode	Tank Name: N/A	Controller (Liters/Minute): 0
	Gas Name: N/A	Gas Concentration (PPM): 0

Tank 4:

Anode	Tank Name: N/A	Controller (Liters/Minute): 0
	Gas Name: N/A	Gas Concentration (PPM): 0

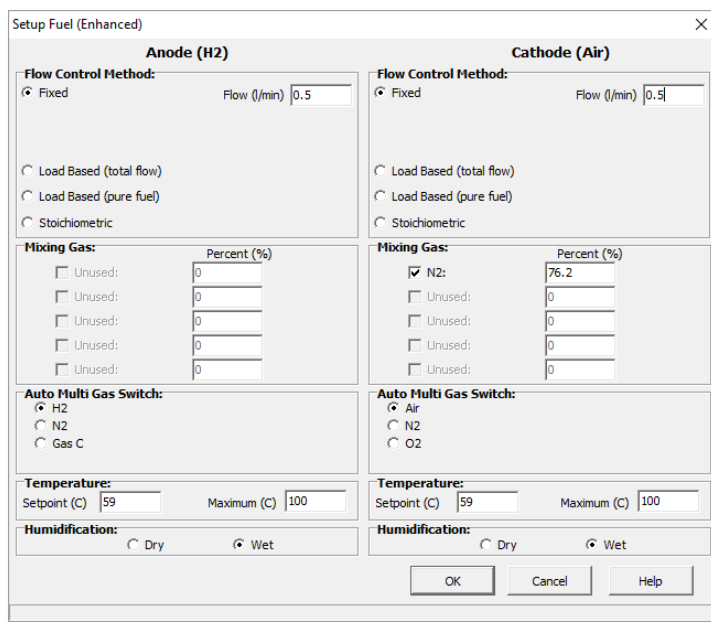
Tank 5:

Anode	Tank Name: N/A	Controller (Liters/Minute): 0
	Gas Name: N/A	Gas Concentration (PPM): 0

Concentration Display Units: Percent

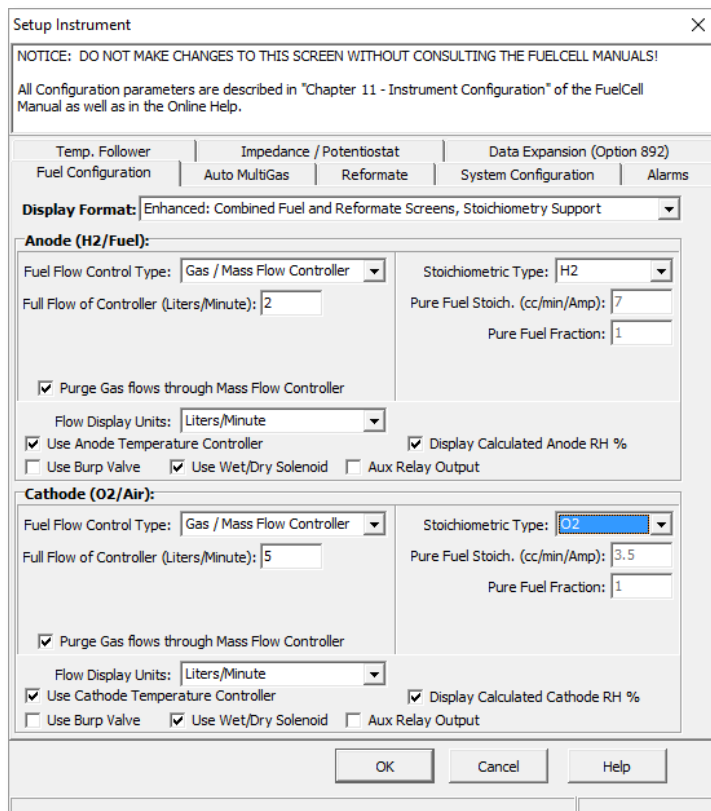
OK Cancel Help

For a final gas mix of 5% O₂, the Air needs to be diluted by a factor of 4.2x (= 21% / 5%). The fraction of pure N₂ flow is then 76.2%:



The FuelCell software will take care of the rest. It also works in load-based and stoichiometric flow rate controlled mode. FuelCell will vary the proportion of Air and pure N₂ to get the final desired concentration of O₂.

Note that if the main cathode gas is pure O₂ and not Air than you must configure FuelCell for O₂ in the Fuel Configuration menu:



If O2 were the main cathode gas, than the N2 mixing gas percent would be 95%:

The screenshot shows the 'Setup Fuel (Enhanced)' dialog box with the following configurations:

- Anode (H2):**
 - Flow Control Method: Fixed, Flow (l/min) 0.5
 - Load Based (total flow):
 - Load Based (pure fuel):
 - Stoichiometric:
 - Mixing Gas:
 - Unused: 0
 - Unused: 0
 - Unused: 0
 - Unused: 0
 - Unused: 0
 - Auto Multi Gas Switch: H2, N2, Gas C
 - Temperature: Setpoint (C) 59, Maximum (C) 100
 - Humidification: Dry, Wet
- Cathode (O2):**
 - Flow Control Method: Fixed, Flow (l/min) 0.5
 - Load Based (total flow):
 - Load Based (pure fuel):
 - Stoichiometric:
 - Mixing Gas:
 - N2: 95
 - Unused: 0
 - Unused: 0
 - Unused: 0
 - Unused: 0
 - Auto Multi Gas Switch: Air, N2, O2
 - Temperature: Setpoint (C) 59, Maximum (C) 100
 - Humidification: Dry, Wet

Buttons: OK, Cancel, Help

Footer: Percent of gas to be added to the main fuel gas 0 <= x <= 100