

OLI Engine for Petro-SIM V7.x

Getting Started Guide

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Overview

The OLI Engine for Petro-SIM interface greatly enhances Petro-SIM's capability to model electrolyte systems. A rigorous and self-consistent thermodynamic framework is employed to tame the mathematically stiff equations commonly found in electrolyte systems. Also, a database of over 10,000 components is available.

The OLI model is available as a property set within Petro-SIM. This "Getting Started" guide will show you how to create the electrolyte chemistry for a simple case and then create a simple flowsheet in Petro-SIM.

Assumptions

The following assumptions are made for this guide:

1. Petro-SIM is currently installed and running on your computer.
2. The license manager for Petro-SIM is currently set up.
3. The OLI Engine for the Petro-SIM product has been installed.
4. The OLI security model is running.
5. Petro-SIM V7.4 is being used.
6. The user is expected to know how to run Petro-SIM.

Application

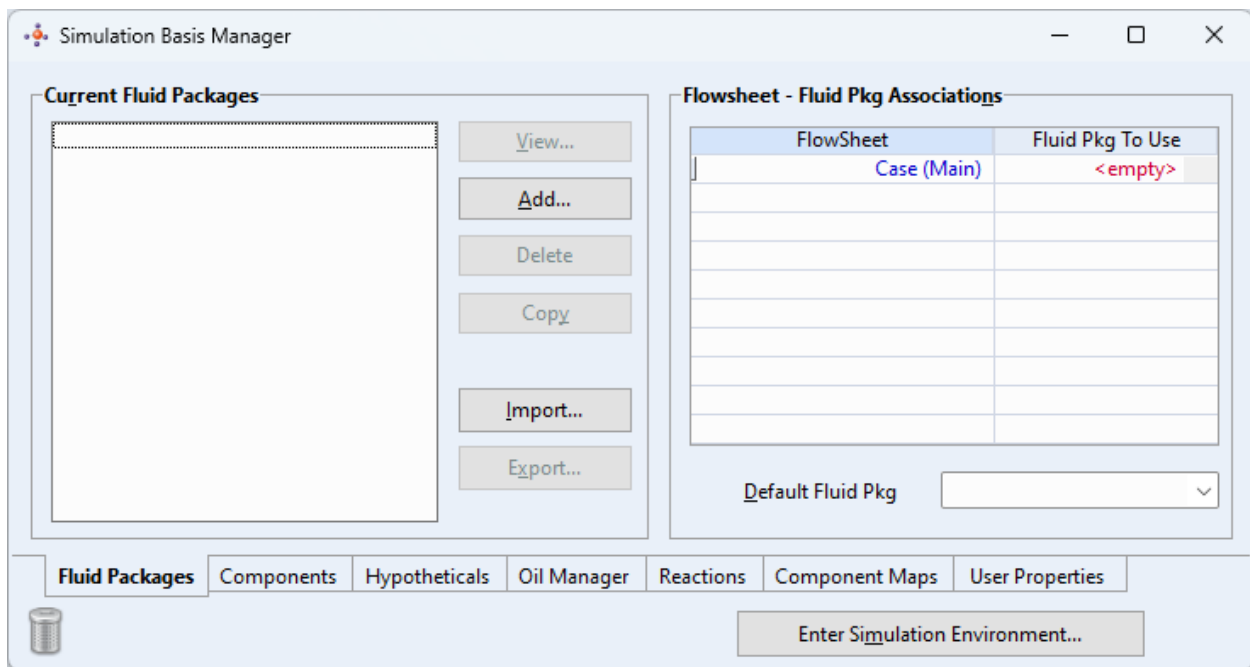
This application will take an acid stream and titrate it against a basic stream to see the resultant pH changes. Some heat and vapor are expected to be evolved.

Here we will provide a few steps to get you started.

In this application, we will mix a nominally basic stream of H₂O, CO₂, NH₃, and SO₂ with an acidic stream of H₂O, H₂SO₄, and HCl.

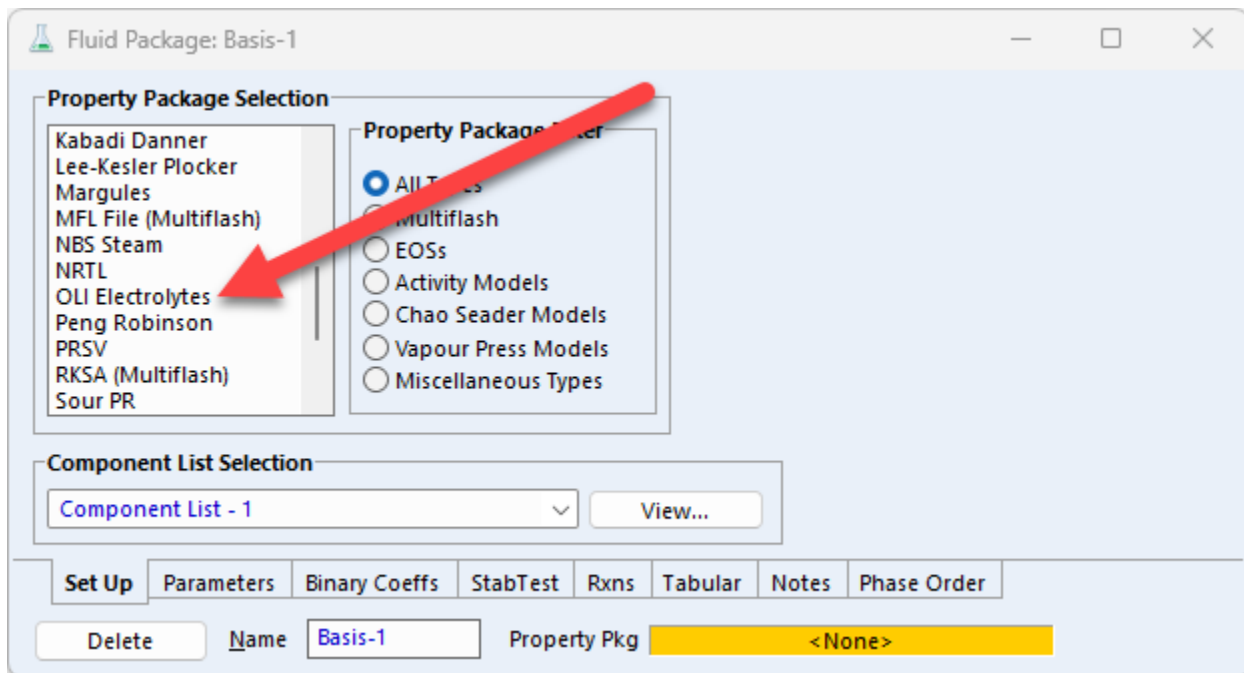
Using the OLI Engine for Petro-SIM

Start Petro-SIM in the normal manner. Create a New **Case from Scratch** (**File > New > Case from scratch**). The Simulation Basis Manager will be displayed.

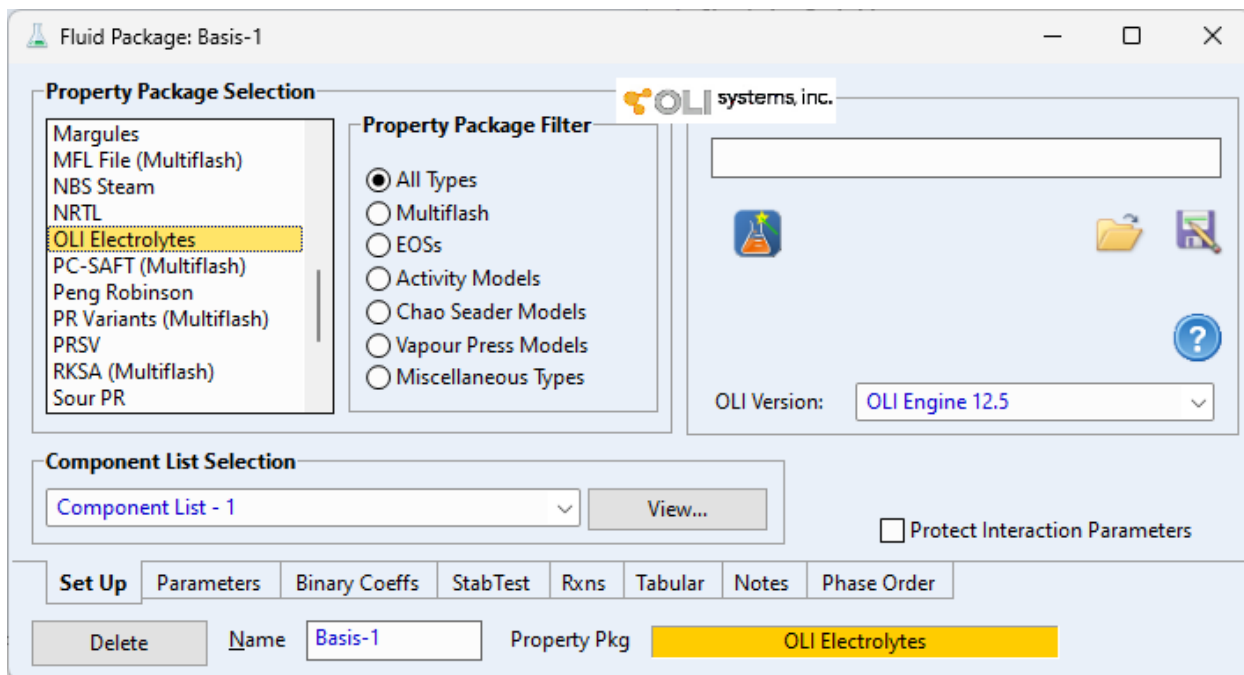


Click the **Add...** button.

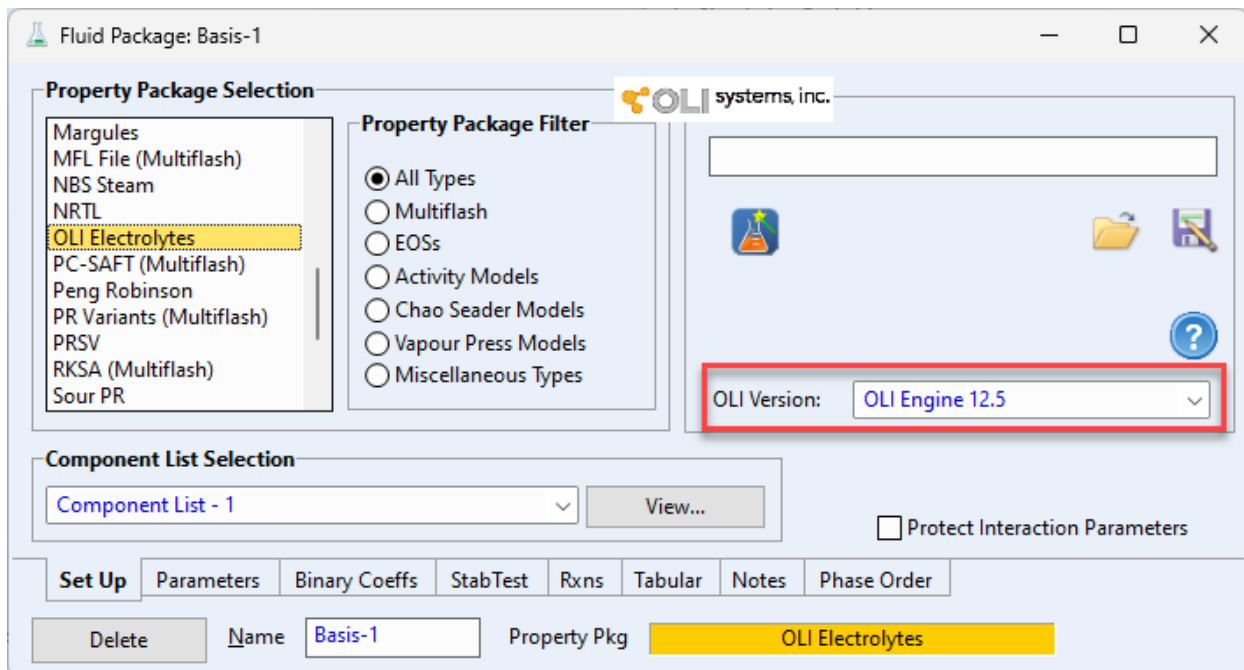
The Fluid Package: Basis-1 screen will appear. OLI recommends that you now select the **OLI Electrolytes fluid package**.



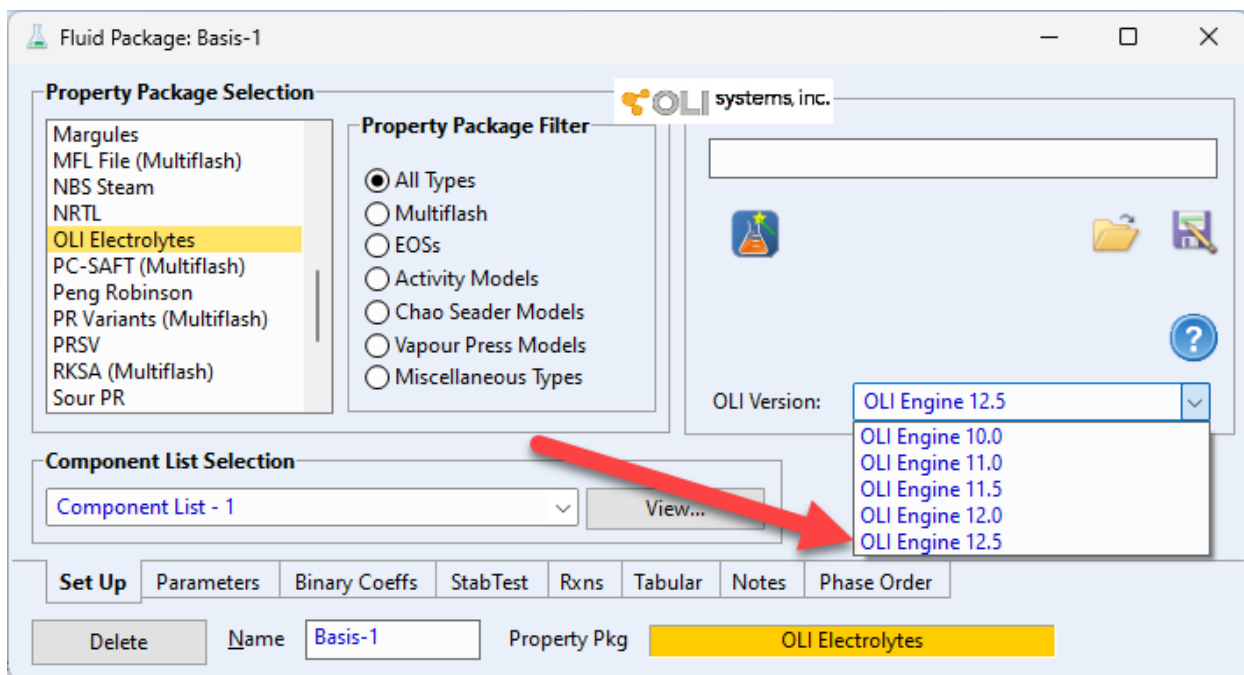
This will display a new panel:



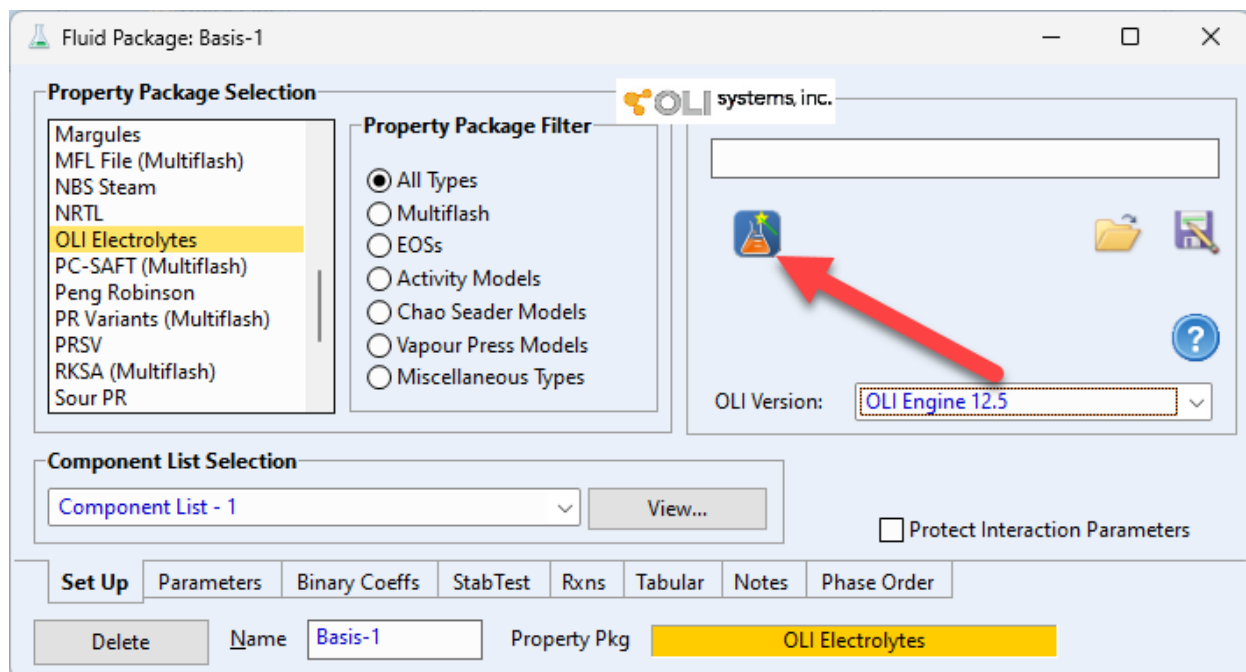
You can use multiple versions of the OLI Engine. Currently displayed is OLI Engine 12.5. If you have more than one OLI Engine, you can select from an older version. Click the drop-down button:



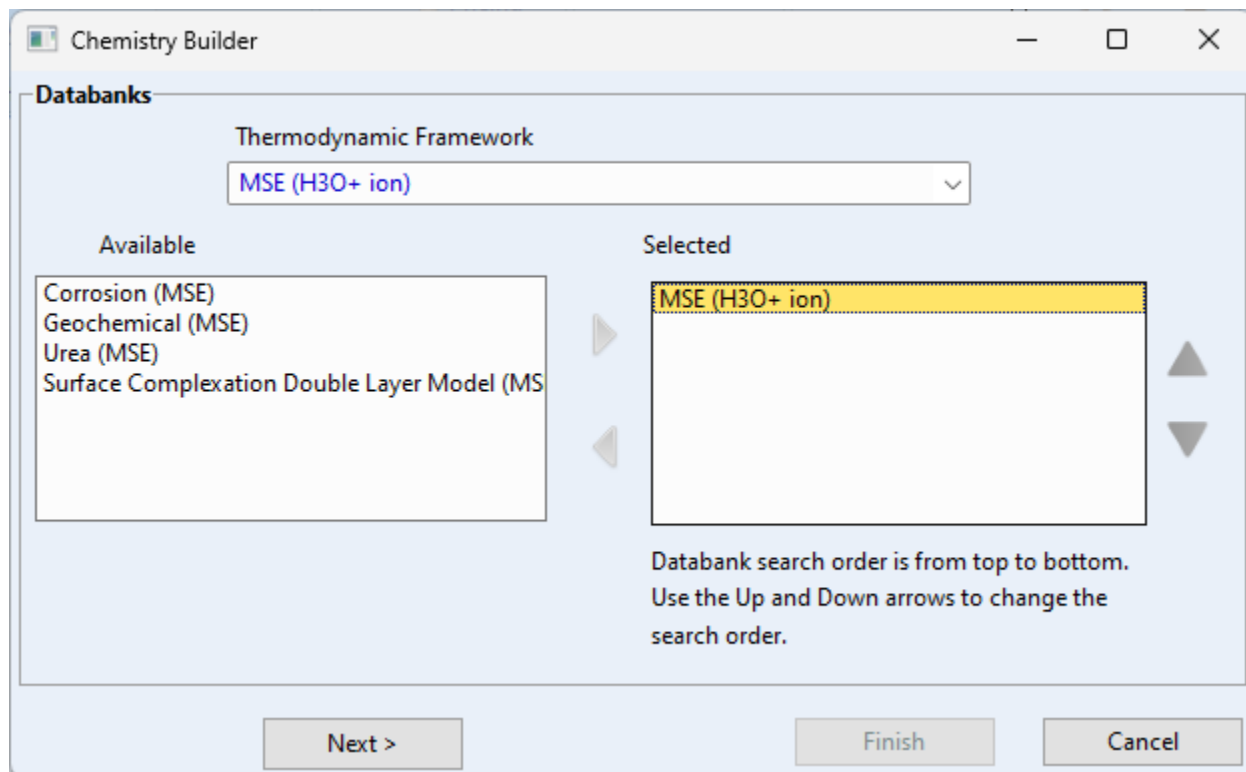
This will show the OLI Engines for Petro-SIM that are installed. Be careful to choose the engine you require (OLI recommends the most recent version).



You can import a previously built OLI model (called a .dbs file) or, preferentially, use the internal OLI Chemistry Wizard.



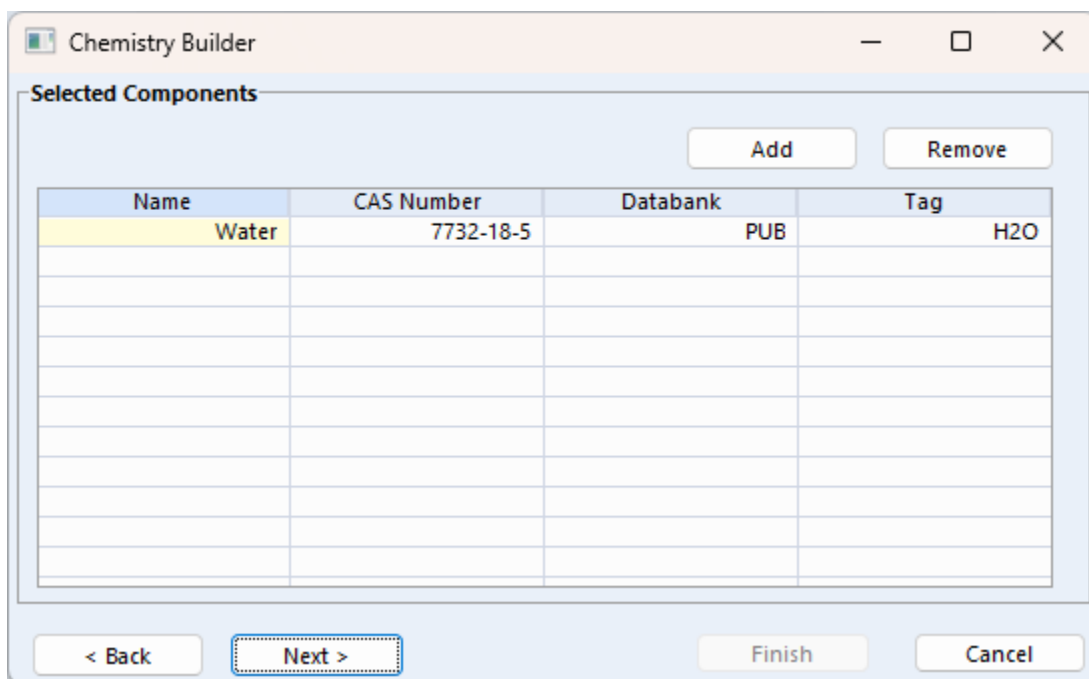
Click the indicated icon.



You can change the thermodynamic framework on this screen as well as select private databases. We'll use the Mixed-Solved Electrolyte (MSE) thermodynamic framework. You can read more on this topic from the following links:

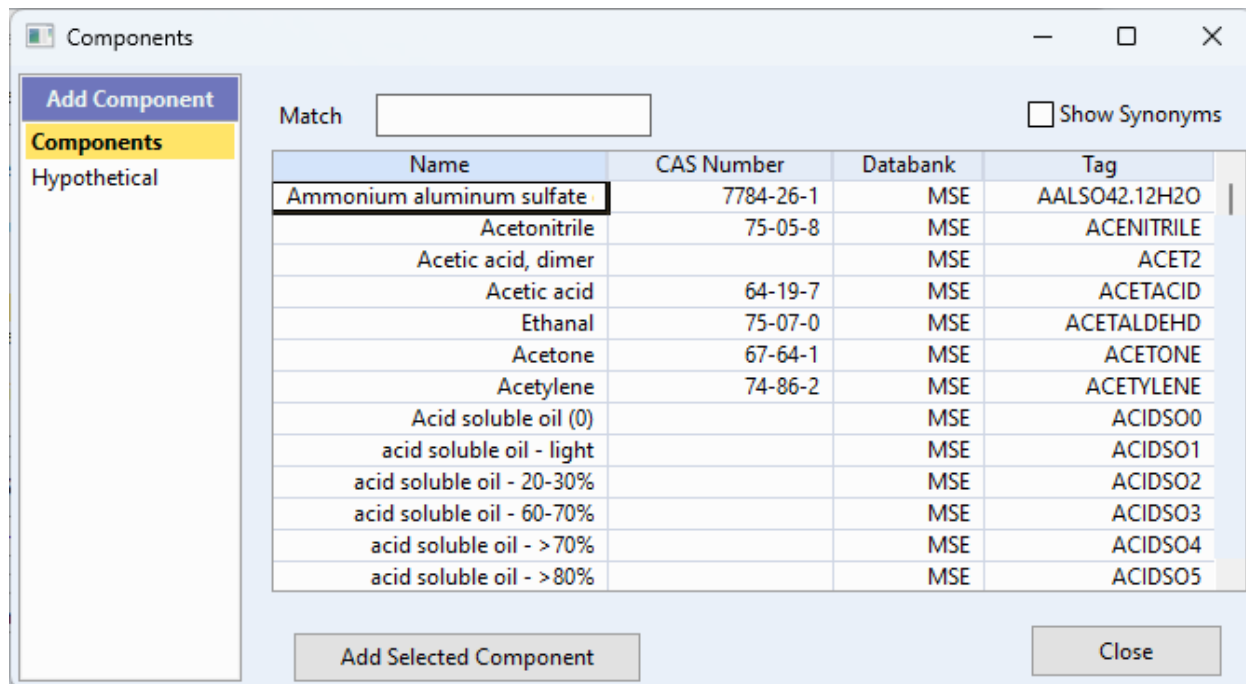
- **When to use the MSE thermodynamic framework instead of the AQ thermodynamic framework:** <https://support.olisystems.com/hc/en-us/articles/28774537885331-When-to-use-the-MSE-thermodynamic-framework-instead-of-the-AQ-thermodynamic-framework>
- **Thermodynamic Frameworks:** <https://support.olisystems.com/hc/en-us/sections/24116537677843-Thermodynamic-Frameworks>

Click the **Next>** button.

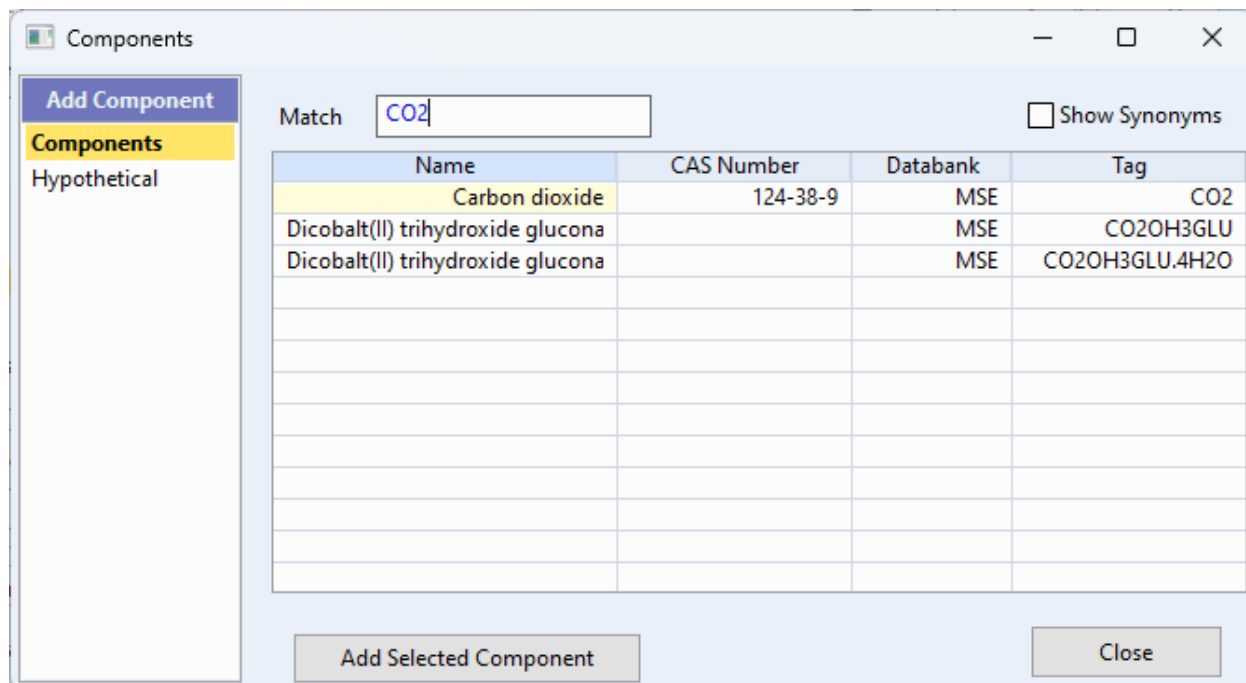


On this dialog, we will enter our components. H₂O is required for all models regardless if there is no flowrate for the component. You cannot remove this species. It will show its databank as PUB (AQ); however, it will actually be using the thermodynamic framework selected in the previous screen (MSE).

Click the **Add** button.



In the **Match** box, enter the first component which is CO₂. You can also scroll down to find the component, but the Match Box is faster.



Click the **Add Selected Component** button.

Selected Components

Add Remove

Name	CAS Number	Databank	Tag
Water	7732-18-5	PUB	H2O
Carbon dioxide	124-38-9	MSE	CO2

Components

Add Component

Components
Hypothetical

Match

Show Synonyms

Name	CAS Number	Databank	Tag
Ammonium aluminum sulfate	7784-26-1	MSE	AALSO42.12H2O
Acetonitrile	75-05-8	MSE	ACENITRILE
Acetic acid, dimer		MSE	ACET2
Acetic acid	64-19-7	MSE	ACETACID
Ethanal	75-07-0	MSE	ACETALDEHD
Acetone	67-64-1	MSE	ACETONE
Acetylene	74-86-2	MSE	ACETYLENE
Acid soluble oil (0)		MSE	ACIDS00
acid soluble oil - light		MSE	ACIDS01
acid soluble oil - 20-30%		MSE	ACIDS02
acid soluble oil - 60-70%		MSE	ACIDS03
acid soluble oil - > 70%		MSE	ACIDS04
acid soluble oil - > 80%		MSE	ACIDS05

Add Selected Component Close

We have moved the dialog to the side to show that carbon dioxide has been added. Repeat these steps to add the following components:

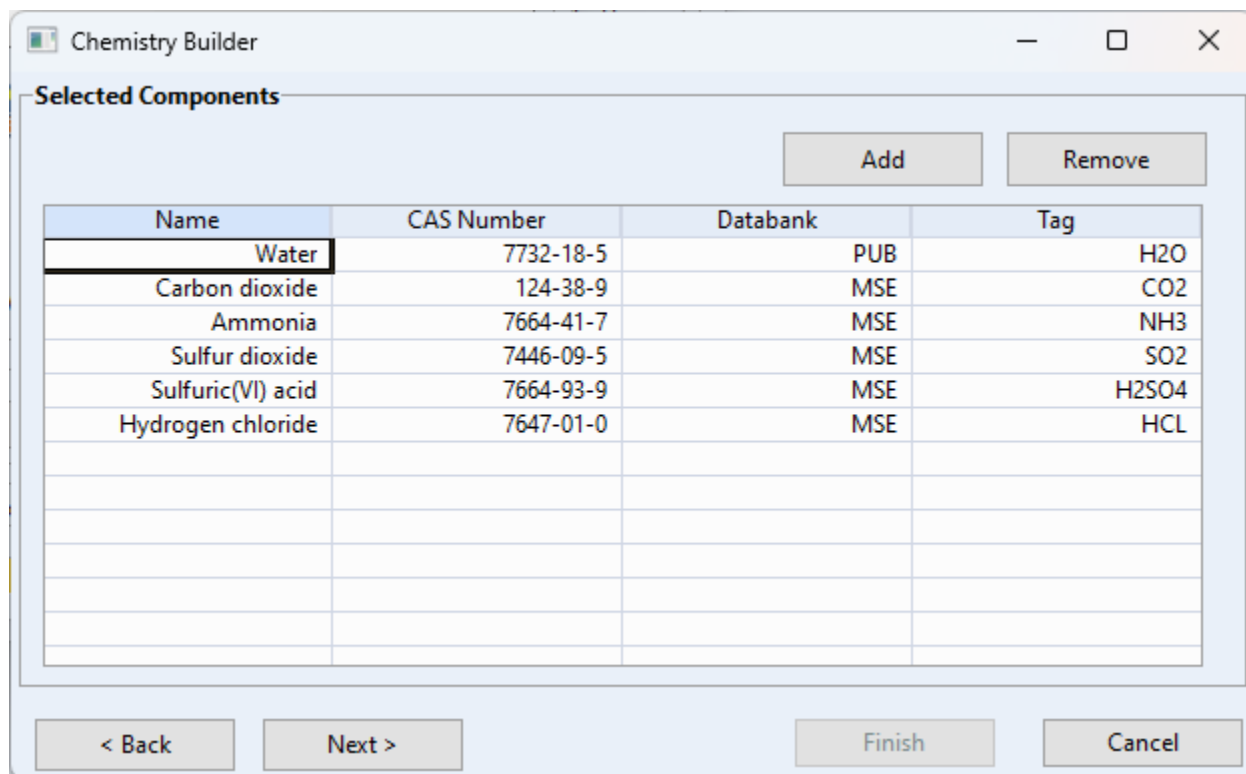
NH₃

SO₂

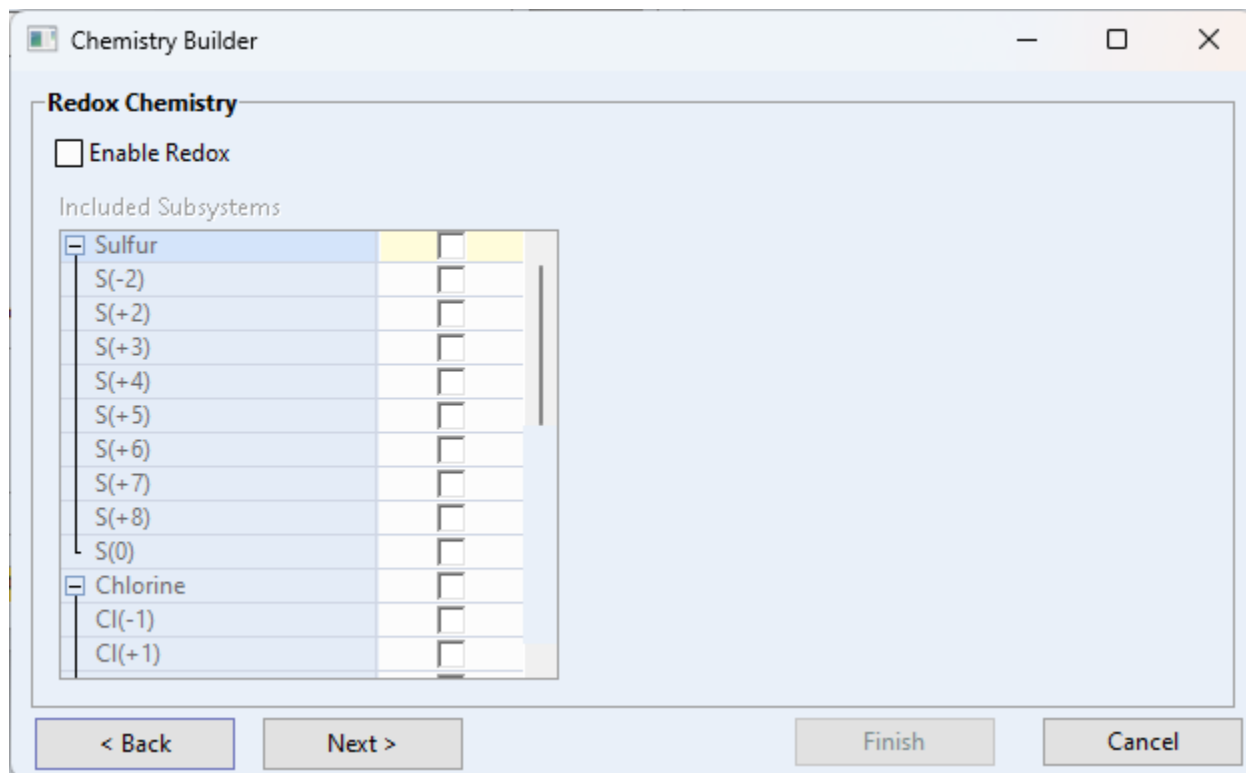
H₂SO₄

HCl

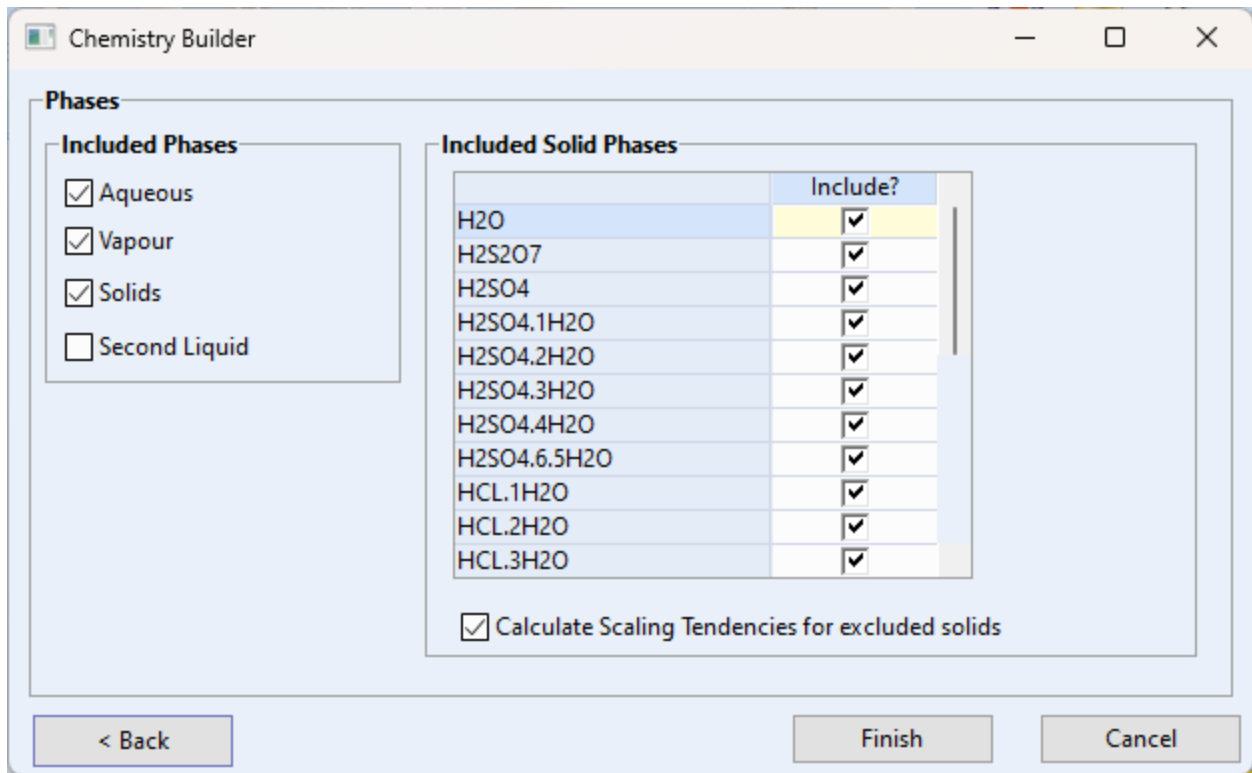
Click the **Close** button when finished.



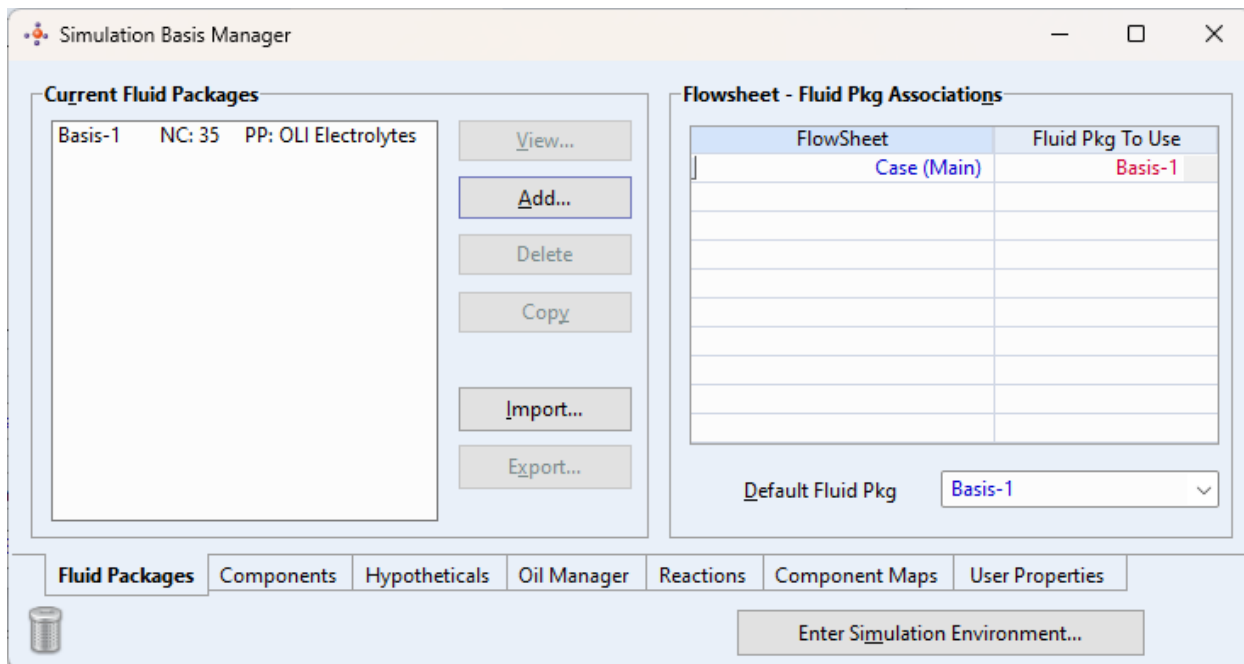
Click **Next>**



The OLI Chemistry property package allows for oxidation and reduction chemistry. For this example, we will not be adding any of these features. Click the **Next>** button.



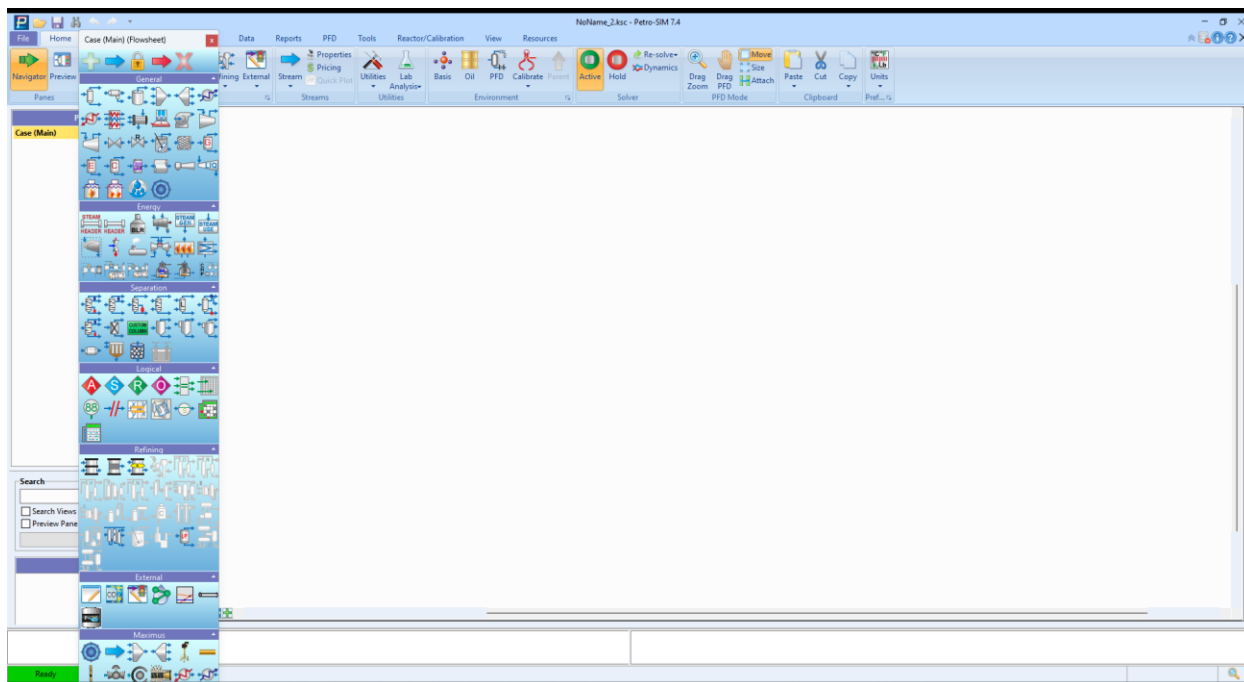
You can modify the phases in the model as well as select individual solid phases to remove. This can speed up the execution of the model by orders of magnitude but should be used with caution and experience. We will not make any modifications here. Click the **Finish>** button.



Click the **Enter Simulation Environment...** button.

Creating the Simulation

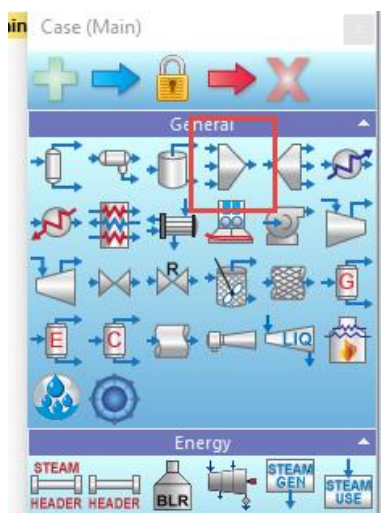
At this point, everything you know about creating simulations in Petro-SIM is still true.



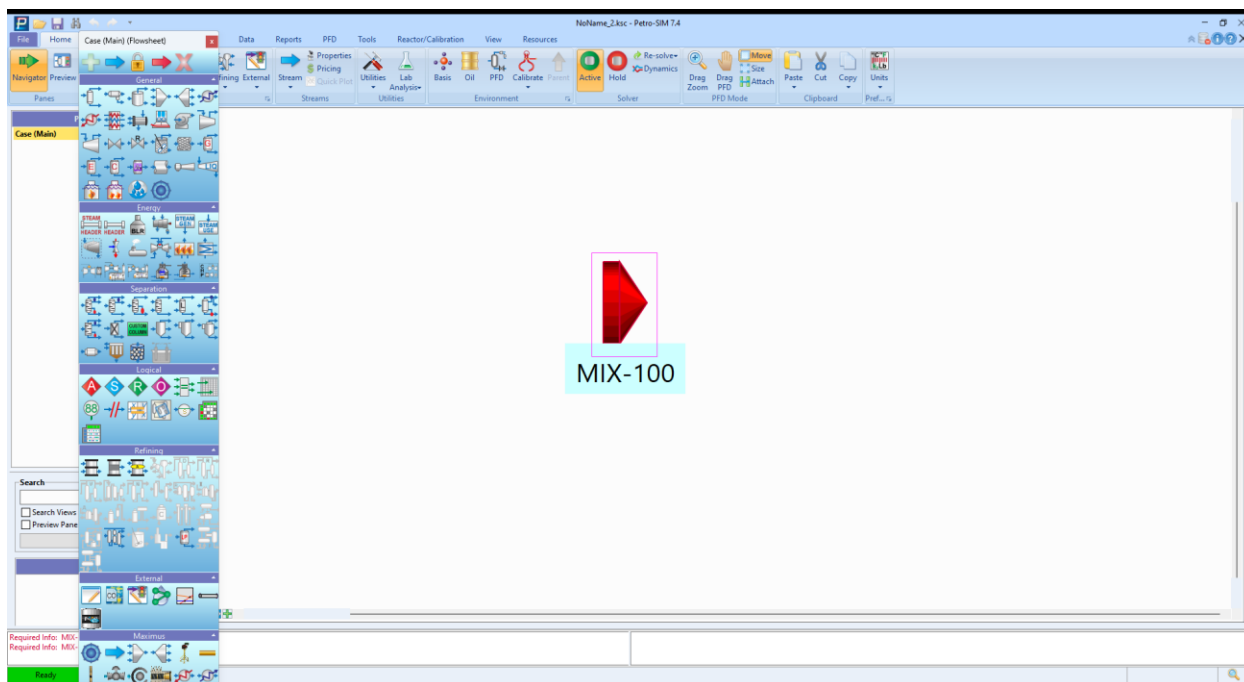
We will now create a small process using a mixer with two inlet streams. The user is expected to know how to create the process. Please do not enter any conditions for the inlet streams at this time.

Selecting the mixer

From the tools palette, we will click on the **mixer** (in General) and then drag it to the workspace.



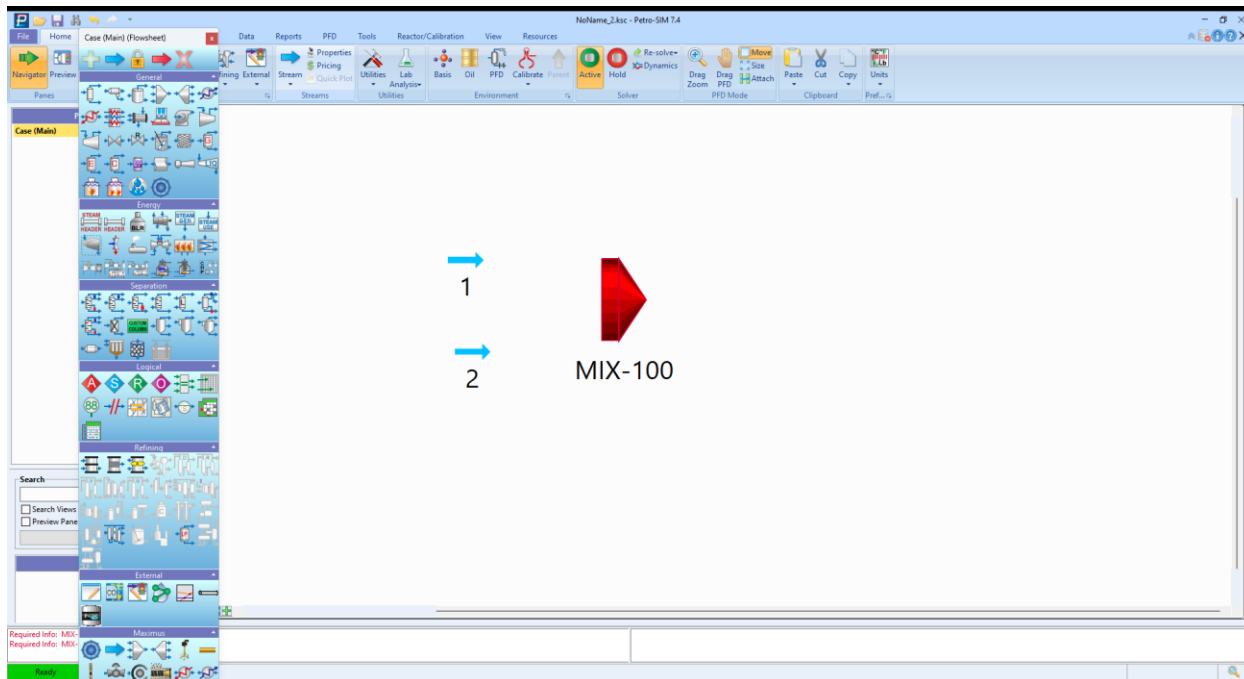
The workspace now looks like this:



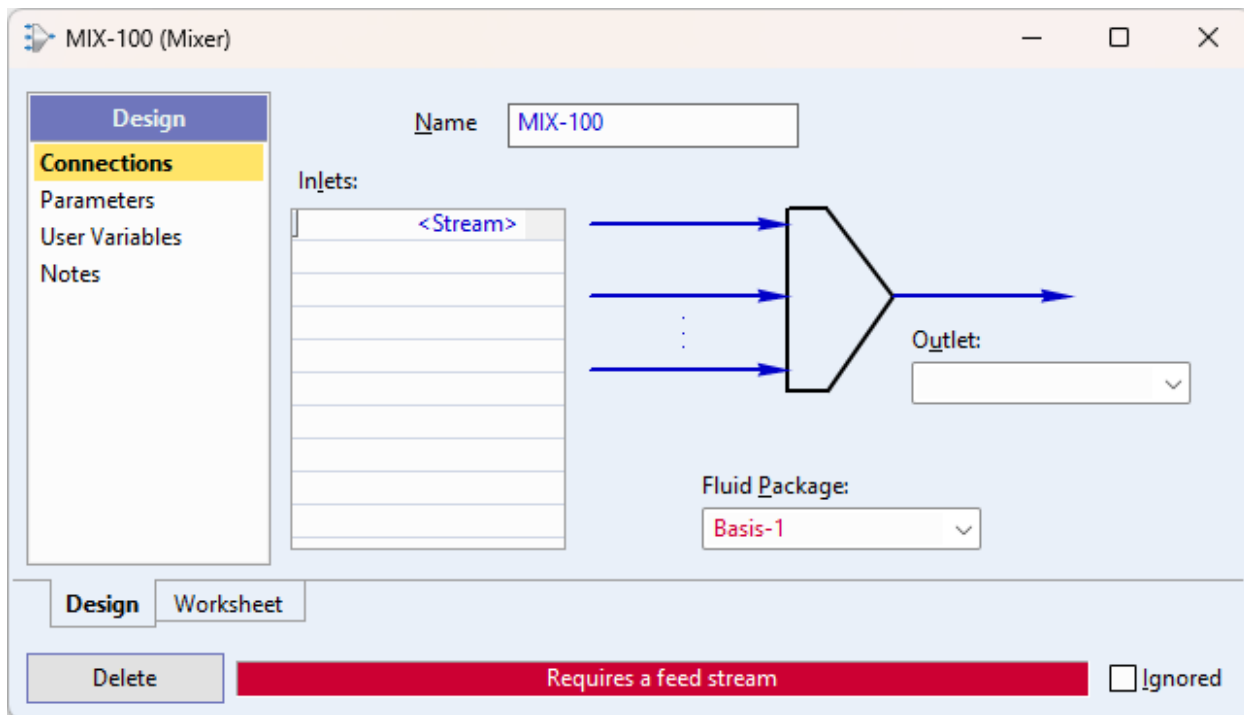
The mixer is given a default name of MIX-100. You can change it later if you wish. The block is also colored RED. This indicates that the block does not have sufficient information to calculate.

We need to create two inlet streams.

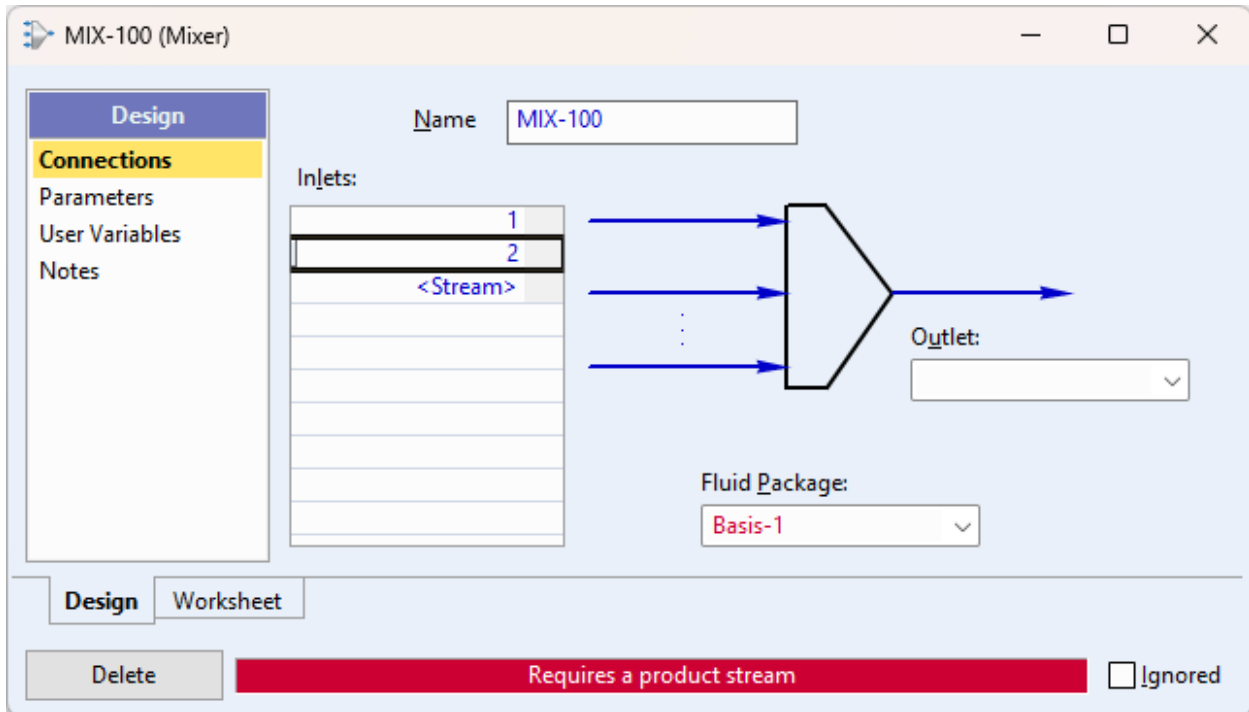
Click on the **Material Streams** arrows, and place two of them on the workspace.



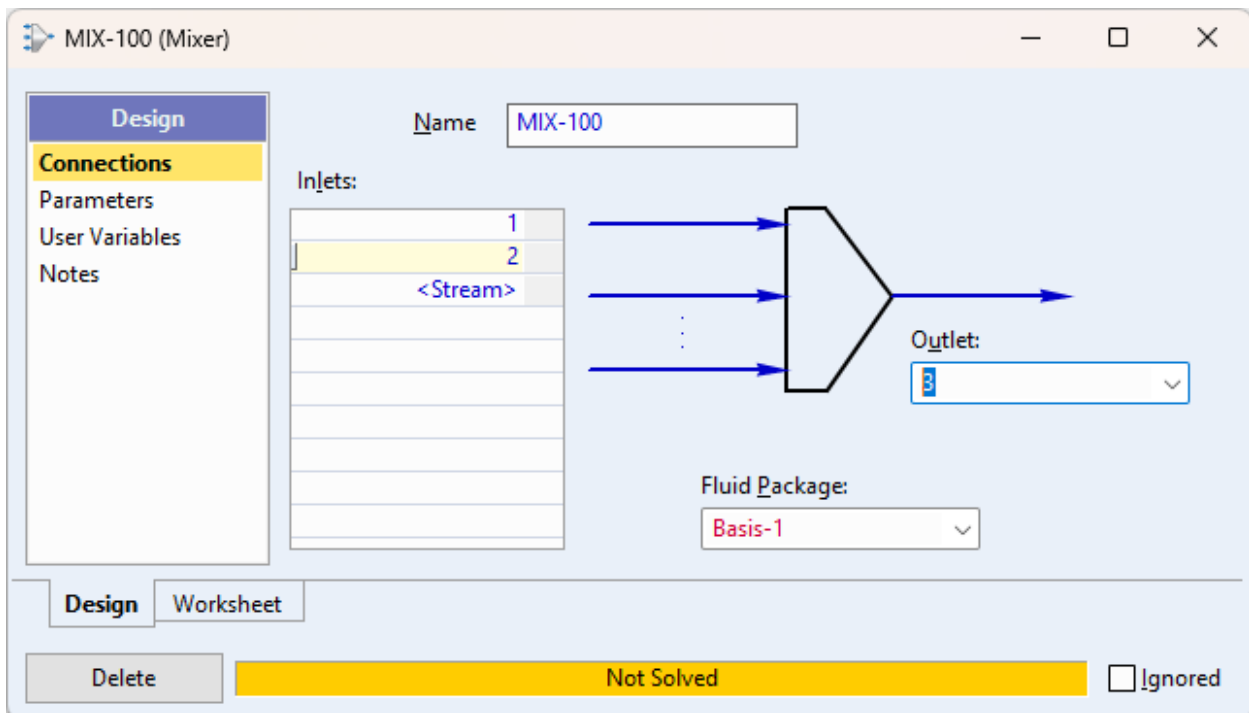
Double-click the Mixer Block. This will open another window.



Locate the *Inlets* area and click in the first cell. Select stream "1." Repeat for stream "2."



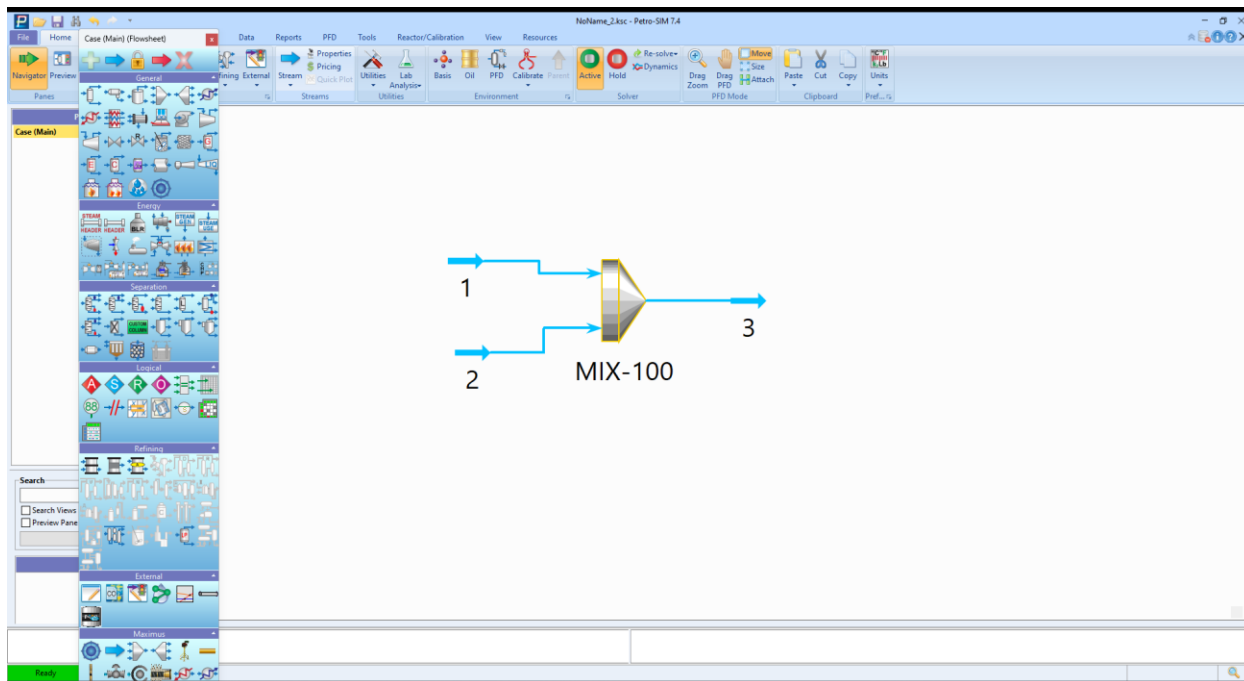
Locate the **Outlet** box and enter the number “3”. This completes this block.



The status bar should be yellow. This indicates that the block has not been calculated.

Click the **x** in the upper right-hand corner to close this dialog.

This is the partially completed process. The streams are light blue to indicate that they have not been calculated.



Entering Stream Composition Data

Double-click stream "1." This will open a new window.

Worksheet	Stream Name	
Conditions	Vapour / Phase Fraction	< empty >
Properties	Temperature [F]	< empty >
Composition	Pressure [psig]	< empty >
Solids	Molar Flow [SCFH]	< empty >
Species	Mass Flow [lb/hr]	< empty >
K Value	Std Ideal Liq Vol Flow [barrel/day]	< empty >
User Variables	Molar Enthalpy [Btu/lbmole]	< empty >
Economics	Molar Entropy [Btu/lbmole-F]	< empty >
Bulk Properties	Heat Flow [MMBtu/hr]	< empty >
Notes	Liq Vol Flow @Std Cond [barrel/day]	< empty >
Time Series	HHV Based Flow [MMBtu/hr]	< empty >
Time Results	Fluid Package	Basis-1
	Stream Type	
	Short Name	

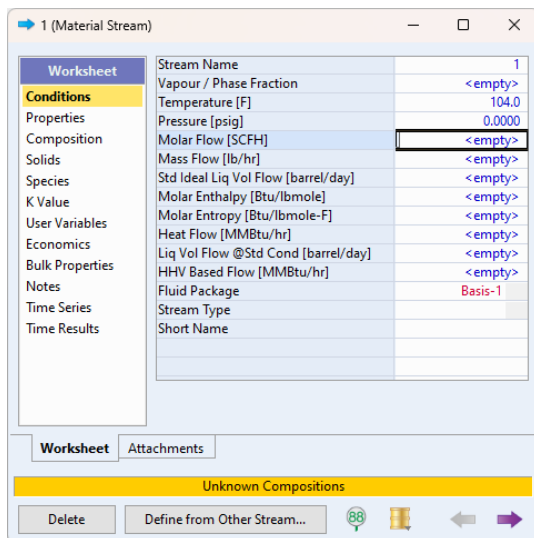
Worksheet Attachments

Unknown Compositions

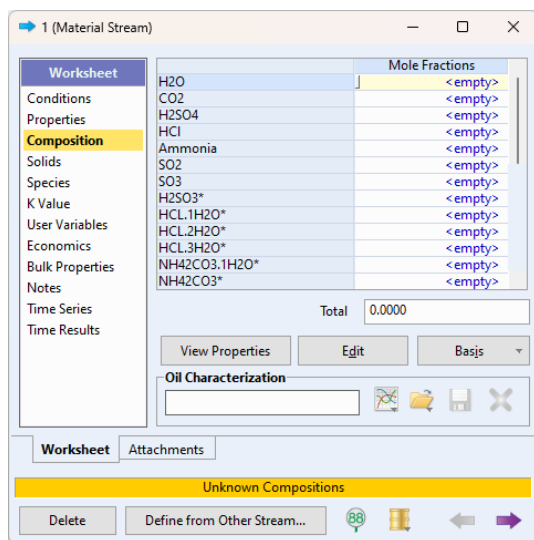
Delete Define from Other Stream...

This is the standard input window for a stream. We will now add our conditions.

- Locate the cell for Temperature [F] and enter 104
- Locate the cell for Pressure [psig] and enter 0.0



Now click the **Composition** line



We can now enter our composition for our components.

Now begin entering the value for **H2O** of 0.978

This will pop open another dialog.

Species	Mole Fraction
H2O	0.9780
CO2	0.001000
H2SO4	0.0000
HCl	0.0000
Ammonia	0.02000
SO2	0.001000
SO3	<empty>
H2S2O7*	<empty>
H2SO3*	<empty>
H2SO4.1H2O*	<empty>
H2SO4.2H2O*	<empty>
H2SO4.3H2O*	<empty>
H2SO4.4H2O*	<empty>
H2SO4.6.5H2O*	<empty>
HCL.1H2O*	<empty>
HCL.2H2O*	<empty>
HCL.3H2O*	<empty>
NH42CO3.1H2O*	<empty>
NH42CO3*	<empty>
NH42S2O5*	<empty>
Total	1.000

Composition Basis

- Mole Fractions
- Mass Fractions
- Liq Volume Fractions
- Mole Flows
- Mass Flows
- Liq Volume Flows
- Mole Percents
- Mass Percents
- Liq Volume Percents

Composition Controls

Erase

Normalize

Cancel

OK

Enter the compositions as shown and then click the **OK** button.

Go back to the **Conditions** category, and enter a molar flow of 100 lbmole/hr.

Property	Value
Stream Name	1
Vapour / Phase Fraction	0.0000
Temperature [F]	104.0
Pressure [psig]	0.0000
Molar Flow [lbmole/hr]	100.0
Mass Flow [lb/hr]	1806.744099
Std Ideal Liq Vol Flow [barrel/day]	125.2
Molar Enthalpy [Btu/lbmole]	-1.208e+05
Molar Entropy [Btu/lbmole-F]	17.78
Heat Flow [MMBtu/hr]	-12.08
Liq Vol Flow @Std Cond [barrel/day]	125.2
HHV Based Flow [MMBtu/hr]	2.050
Fluid Package	Basis-1
Stream Type	Sour Water
Short Name	

Worksheet Synthesis Attachments

OK

Delete Define from Other Stream...

The status bar should turn green. This indicates that the program has already converged the stream. We can see some useful information at this time.

Click on the **Properties** line.

Property	Value
Stream Name	1
pH	9.698
Osmotic Pressure [psig]	433.4
Ionic Strength (x-based) [lbmol/lb]	4.621e-06
Electrical Conductivity [S/ft]	0.8944
Molar Electrical Conductivity [S-ft ² /lbmole]	0.0000
Mass Flow [lb/hr]	1806.744099
Molecular Weight	18.07
Molar Density [lbmole/ft ³]	3.435
Actual Mass Density [lb/ft ³]	62.07
Act. Volume Flow [barrel/day]	124.4
Mass Enthalpy [Btu/lb]	-6686
Mass Entropy [Btu/lb-F]	0.9839
Heat Capacity [Btu/lbmole-F]	17.90
Mass Heat Capacity [Btu/lb-F]	0.9908

You can drag the dialog to the right to expand it to see more data.

1 (Material Stream)

Worksheet	Stream Name	1	Aqueous Phase
Conditions	pH	9.698	9.698
Properties	Osmotic Pressure [psig]	433.4	<empty>
	Ionic Strength (x-based) [lbmol/lb]	4.621e-06	<empty>
Composition	Electrical Conductivity [S/ft]	0.8944	<empty>
Solids	Molar Electrical Conductivity [S-ft ² /lbmole-F]	0.0000	<empty>
Species	Mass Flow [lb/hr]	1806.744099	1806.744099
K Value	Molecular Weight	18.07	18.07
User Variables	Molar Density [lbmole/ft ³]	3.435	3.435
Economics	Actual Mass Density [lb/ft ³]	62.07	62.07
Bulk Properties	Act. Volume Flow [barrel/day]	124.4	124.4
	Mass Enthalpy [Btu/lb]	-6686	-6686
Notes	Mass Entropy [Btu/lb-F]	0.9839	0.9839
Time Series	Heat Capacity [Btu/lbmole-F]	17.90	17.90
Time Results	Mass Heat Capacity [Btu/lb-F]	0.9908	0.9908
	Molar Lower Heating Value [Btu/lbmole]	1.238e+05	<empty>
	Mass Lower Heating Value [Btu/lb]	6072	<empty>
	Phase Fraction [Vol Basis]	0.0000	1.000
	Phase Fraction [Mass Basis]	0.0000	1.000
	Cost Based on Flow [Cost/day]	<empty>	<empty>
	Act. Gas Flow [ACFM]	<empty>	<empty>
	Avg. Liq. Density [lb/ft ³]	61.67	61.67
	Specific Heat [Btu/lbmole-F]	17.90	17.90
	Std Gas Flow [MSCFH]	37.95	37.95
	Std. Ideal Liq. Mass Density [API @Std. P]	11.59	11.59
	Act. Liq. Flow [barrel/day]	124.4	124.4
	Z Factor	0.0007072	0.0007072

Property Controls

Worksheet Synthesis Attachments

OK

Delete Define from Other Stream...

The pH of this solution is approximately 9.7. We also provide additional information. You can also explore other buttons, such as composition, to see more information about our report.

Click on the **Composition** line.

The screenshot shows a window titled "1 (Material Stream)" with a table of chemical species and their mole fractions. The table has two columns: "Mole Fractions" and "Aqueous Phase". The species listed include H2O, CO2, H2SO4, HCl, Ammonia, SO2, SO3, H2SO3*, H2SO4* (various hydrates), HCL (various hydrates), NH4CO3 (various hydrates), and NH4HSO4*. The mole fractions are mostly 0.0000, with H2O at 0.9780 and Ammonia at 0.0200. The Aqueous Phase column also shows values, with H2O at 0.9780 and Ammonia at 0.0200. Below the table, there is a "Total" field set to 1.000, and buttons for "View Properties", "Edit", and "Basis". The "Basis" button is highlighted in the screenshot. At the bottom of the window, there are tabs for "Worksheet", "Synthesis", and "Attachments", and a green bar with "OK" and "Delete" buttons.

	Mole Fractions	Aqueous Phase
H2O	0.9780	0.9780
CO2	0.001000	0.001000
H2SO4	0.0000	0.0000
HCl	0.0000	0.0000
Ammonia	0.02000	0.02000
SO2	0.001000	0.001000
SO3	0.0000	0.0000
H2SO3*	0.0000	0.0000
H2SO4*	0.0000	0.0000
H2SO4.1H2O*	0.0000	0.0000
H2SO4.2H2O*	0.0000	0.0000
H2SO4.3H2O*	0.0000	0.0000
H2SO4.4H2O*	0.0000	0.0000
H2SO4.6.5H2O*	0.0000	0.0000
HCL.1H2O*	0.0000	0.0000
HCL.2H2O*	0.0000	0.0000
HCL.3H2O*	0.0000	0.0000
NH4CO3.1H2O*	0.0000	0.0000
NH4CO3*	0.0000	0.0000
NH4S2O5*	0.0000	0.0000
NH4S2O3.1H2O*	0.0000	0.0000
NH4S2O3*	0.0000	0.0000
NH4S2O4*	0.0000	0.0000
NH4CO32*	0.0000	0.0000
NH4HSO42*	0.0000	0.0000
NH4HCO3.1H2O*	0.0000	0.0000

Click on the **Basis** button

The screenshot shows the '1 (Material Stream)' window in OLI software. The 'Composition' tab is selected in the left sidebar. The main table displays the following data:

Species	Mole Fractions	Aqueous Phase
H2O	0.9780	0.9780
CO2	0.001000	0.001000
H2SO4	0.0000	0.0000
HCl	0.0000	0.0000
Ammonia	0.02000	0.02000
SO2	0.001000	0.001000
SO3	0.0000	0.0000
H2S2O7*	0.0000	0.0000
H2SO3*	0.0000	0.0000
H2SO4.1H2O*	0.0000	0.0000
H2SO4.2H2O*	0.0000	0.0000
H2SO4.3H2O*	0.0000	0.0000
H2SO4.4H2O*	0.0000	0.0000
H2SO4.6.5H2O*	0.0000	0.0000
HCL.1H2O*	0.0000	0.0000
HCL.2H2O*	0.0000	0.0000
HCL.3H2O*	0.0000	0.0000
NH42CO3.1H2O*	0.0000	0.0000
NH42CO3*	0.0000	0.0000
NH42S2O5*	0.0000	0.0000
NH42SO3.1H2O*	0.0000	0.0000
NH42SO3*	0.0000	0.0000
NH42SO4*	0.0000	0.0000
NH43CO32*	0.0000	0.0000
NH43HSO42*	0.0000	0.0000
NH44CO3.1H2O*	0.0000	0.0000

The 'Total' is 1.000. A context menu is open over the 'Basis' dropdown, showing options: View Extended Composition, View True Composition (highlighted), View Material Balance Groups, Mole Fractions (checked), Mass Fractions, Volume Fractions, Mole Flows, Mass Flows, Volume Flows, Mole Percents, Mass Percents, Volume Percents, and Apply to All Streams.

Select **View True Composition**

The screenshot shows the '1 (Material Stream)' window in OLI software. The 'Composition' tab is active, and the 'True Mole Fractions' column is highlighted. The table displays the following data:

Species	True Mole Fractions
H2O	0.9781
CO2	8.042e-08
H2SO4	0.0000
HCL	0.0000
NH3	0.003728
SO2	2.062e-14
SO3	0.0000
NH4OH	0.01280
OH (-1)	3.496e-06
CO3 (-2)	0.0002805
H3O (+1)	4.934e-12
HCO3 (-1)	0.0002957
HSO3 (-1)	1.426e-06
HSO4 (-1)	0.0000
NH2CO2 (-1)	0.0004386
NH4 (+1)	0.003327
CL (-1)	0.0000
S2O5 (-2)	2.351e-11
SO3 (-2)	0.001013
SO4 (-2)	0.0000
H2S2O7	0.0000
NH42S2O5	0.0000
NH42SO3	0.0000
NH42SO4	0.0000
NH43CO32	0.0000

The 'Total' is 1.000. The 'Basis' dropdown is set to 'True Mole Fractions'.

Now, you can see things like the solution ions. You can expand the dialog to see information about phases.

We will now repeat the steps for stream "2" but with different compositions. Please enter the following composition for stream "2" in mole fraction.

Temperature	77	[F]
Pressure	0	[psig]
H2O	0.979	
HCl	0.001	
H2SO4	0.02	
Total molar flow	100	[lbmole/hr]

Click the **Properties** line to see the pH.

2 (Material Stream)

Stream Name	2
pH	-0.1329
Osmotic Pressure [psig]	1043
Ionic Strength (x-based) [lbmol/lb]	2.757e-05
Electrical Conductivity [S/ft]	13.60
Molar Electrical Conductivity [S-ft ² /lbmole]	0.0000
Mass Flow [lb/hr]	1924.970802
Std Ideal Liq Vol Flow [barrel/day]	126.9
Act. Gas Flow [ACFM]	<empty>
Molecular Weight	19.25
Molar Density [lbmole/ft ³]	3.468
Actual Mass Density [lb/ft ³]	66.75
Act. Volume Flow [barrel/day]	123.3
Mass Enthalpy [Btu/lb]	-6520
Mass Entropy [Btu/lb-F]	0.8690

Property Controls

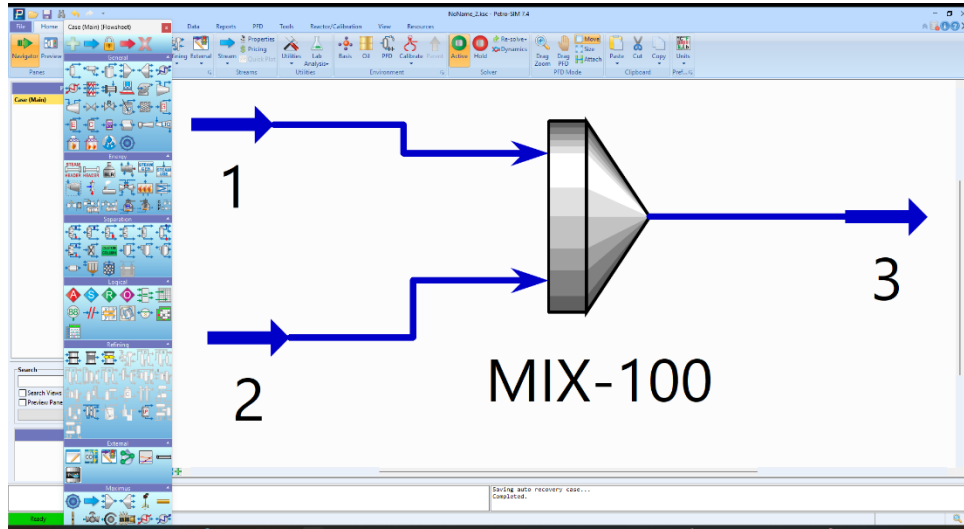
Worksheet Synthesis Attachments

OK

Delete Define from Other Stream...

Click the **x** to close the dialog.

Petro-SIM will attempt to converge the process as you create it. As you close the final dialog box for data entry, you will see that the output stream "3" is "Blue" which means it has converged.



Reviewing the output

Double-click stream "3"

3 (Material Stream)

Worksheet	Stream Name	3
Conditions	Vapour / Phase Fraction	0.0002
Properties	Temperature [F]	102.5
Composition	Pressure [psig]	0.0000
Solids	Molar Flow [lbmole/hr]	200.0
Species	Mass Flow [lb/hr]	3731.714901
K Value	Std Ideal Liq Vol Flow [barrel/day]	252.2
User Variables	Molar Enthalpy [Btu/lbmole]	-1.231e+05
Economics	Molar Entropy [Btu/lbmole-F]	17.66
Bulk Properties	Heat Flow [MMBtu/hr]	-24.63
Notes	Liq Vol Flow @Std Cond [barrel/day]	252.2
Time Series	HHV Based Flow [MMBtu/hr]	4.017
Time Results	Fluid Package	Basis-1
	Stream Type	Sour Water
	Short Name	

Worksheet Attachments

OK

Delete Define from Other Stream...

The converged process temperature is approximately 102.5 °F.

Click on the **Properties** line.

Property	Value
Stream Name	3
pH	0.8991
Osmotic Pressure [psig]	448.2
Ionic Strength (x-based) [lbmol/lb]	1.642e-05
Electrical Conductivity [S/ft]	4.706
Molar Electrical Conductivity [S-ft ² /lbm]	0.0000
Mass Flow [lb/hr]	3731.714901
Std Ideal Liq Vol Flow [barrel/day]	252.2
Act. Gas Flow [ACFM]	0.2228
Molecular Weight	18.66
Molar Density [lbmole/ft ³]	2.799
Actual Mass Density [lb/ft ³]	52.23
Act. Volume Flow [barrel/day]	305.4
Mass Enthalpy [Btu/lb]	-6600
Mass Entropy [Btu/lb-F]	0.9466

The converged pH is 0.9 indicating that some acid/base chemistry has taken place. What about the equilibrium compositions that have been calculated?

Click the **Composition** line and use the **Basis** button to **View True Composition**

3 (Material Stream)

	True Mole Fractions	Vapour Phase	Aqueous Phase
H2O	0.9752	0.06874	0.9753
CO2	0.0005050	0.8985	0.0003565
H2SO4	2.992e-09	8.931e-20	2.992e-09
HCL	6.047e-12	4.735e-09	5.266e-12
NH3	1.550e-11	1.227e-10	1.548e-11
SO2	0.0004520	0.03273	0.0004467
SO3	1.778e-22	2.518e-26	1.778e-22
NH4OH	5.411e-11	0.0000	5.412e-11
OH (-1)	5.966e-15	0.0000	5.967e-15
CO3 (-2)	8.249e-18	0.0000	8.250e-18
H3O (+1)	0.003332	0.0000	0.003332
HCO3 (-1)	2.719e-09	0.0000	2.720e-09
HSO3 (-1)	5.290e-05	0.0000	5.291e-05
HSO4 (-1)	0.006920	0.0000	0.006921
NH2CO2 (-1)	1.874e-17	0.0000	1.875e-17
NH4 (+1)	0.01010	0.0000	0.01010
CL (-1)	0.0004951	0.0000	0.0004952
S2O5 (-2)	4.197e-08	0.0000	4.197e-08
SO3 (-2)	1.211e-10	2.518e-26	1.211e-10
SO4 (-2)	0.002982	0.0000	0.002982
H2S2O7	0.0000	0.0000	0.0000
NH42S2O5	0.0000	0.0000	0.0000
NH42SO3	0.0000	0.0000	0.0000
NH42SO4	0.0000	0.0000	0.0000
NH43CO32	0.0000	0.0000	0.0000
NH43HSO42	0.0000	0.0000	0.0000
NH4CLB	0.0000	0.0000	0.0000
NH4CL	0.0000	0.0000	0.0000
NH4CO2NH2	0.0000	0.0000	0.0000
NH4H3SO42	0.0000	0.0000	0.0000
NH4HCO3	0.0000	0.0000	0.0000
NH4HSO4	0.0000	0.0000	0.0000
H2SO4.1H2O	0.0000	0.0000	0.0000
H2SO4.2H2O	0.0000	0.0000	0.0000
H2SO4.3H2O	0.0000	0.0000	0.0000
H2SO4.4H2O	0.0000	0.0000	0.0000
H2SO4.6.5H2O	0.0000	0.0000	0.0000
HCL.1H2O	0.0000	0.0000	0.0000
HCL.2H2O	0.0000	0.0000	0.0000
HCL.3H2O	0.0000	0.0000	0.0000
NH42CO3.1H2O	0.0000	0.0000	0.0000
NH42SO3.1H2O	0.0000	0.0000	0.0000
NH44HCO3.1H2O	0.0000	0.0000	0.0000

Total 1.000

View Properties Edit Basis

Oil Characterization

Worksheet Attachments

OK

Delete Define from Other Stream...

This now completes the getting started guide. It is strongly recommended that you save your file at this time.

Additional Resources

Our [Support Center](#) has more articles for using the OLI Engine in Petro-SIM®. See more here:

- Using OLI Engine in Petro-SIM®: <https://support.olisystems.com/hc/en-us/articles/37054530247955-Using-OLI-Engine-in-Petro-SIM>
- OLI Engine V12 for Petro-SIM®: Getting Started User Guide: <https://support.olisystems.com/hc/en-us/articles/37376053273107-OLI-Engine-V12-for-Petro-SIM-Getting-Started-User-Guide>
- Using an OLI .dbs Chemistry File in Petro-SIM®: <https://support.olisystems.com/hc/en-us/articles/37434861404179-Using-an-OLI-dbs-Chemistry-File-in-Petro-SIM>
- OLI Engine in Petro-SIM® page: <https://support.olisystems.com/hc/en-us/sections/37054468310035-OLI-Engine-in-Petro-SIM>

Disclaimer

This tutorial was created with Petro-SIM 7.4 and the OLI Engine version 12.5.18.0. As time progresses, updates to the OLI databanks and engine may result in changes to the results displayed here. It is not guaranteed that later versions of either Petro-SIM or OLI will yield the same results.

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