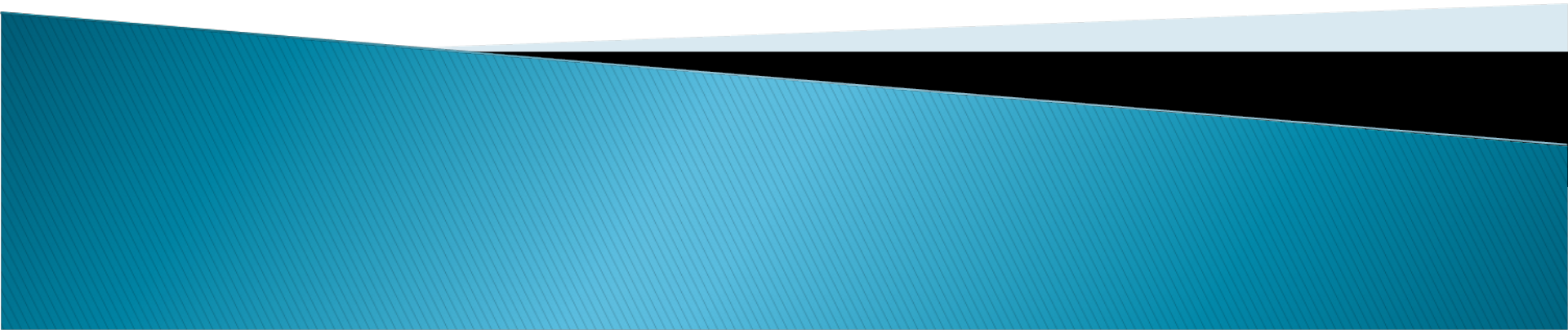


# ASPEN Chromatography Simulation



# IEC (Ion Exchange) Simulation

# IEC (Ion Exchange) Simulation

## ▶ Abstract

- **Ovalbumin : About 55% of egg white**
- **Separation of ovalbumin was performed by FPLC system of DEAE ion exchange chromatography.**

- **Ovalbumin : About 55% of egg white**

- **Counter Ion : Na<sup>+</sup>**
- **Exchanged Ions : Ovalbumin**
- **Column Height : 7.46 cm**
- **Column Diameter : 1.6 cm**
- **Voidage : 0.35**

● **Ovalbumin Isotherm Parameters :**

	<u>IP1</u>	<u>IP2</u>	<u>IP3</u>
	0.5	$2.64 \cdot 10^{-5}$	-6.21

## ▶ Abstract

- **Simulation conditions**

- **Counter Ion : Na<sup>+</sup>**
- **Exchanged Ions : Ovalbumin**
- **Column Height : 7.46 cm**
- **Column Diameter : 1.6 cm**
- **Voidage : 0.35**

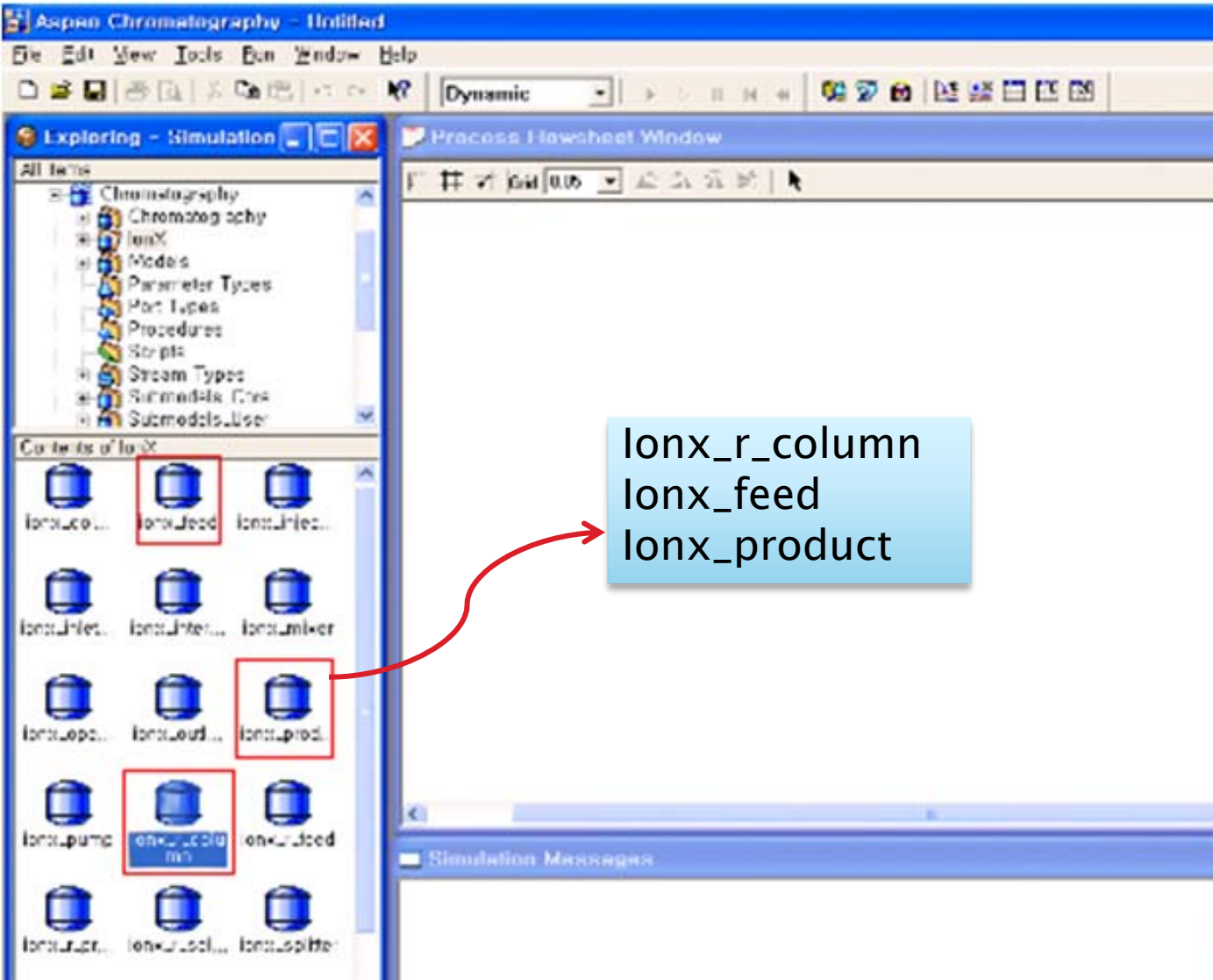
- **Ovalbumin Isotherm Parameters :**
- |  | <u>IP1</u> | <u>IP2</u>                  | <u>IP3</u>   |
|--|------------|-----------------------------|--------------|
|  | <b>0.5</b> | <b>2.64*10<sup>-5</sup></b> | <b>-6.21</b> |

The screenshot displays the Aspen Chromatography software interface. The main window is titled "Aspen Chromatography - Untitled" and features a menu bar (File, Edit, View, Tools, Run, Window, Help) and a toolbar. A "Process Flowsheet Window" is open, showing a grid with a size of 0.05. A "Build Component Set - Default" dialog box is prominently displayed in the foreground. This dialog box contains a list of components with the following entries:

Name
Na
Ovalbumin

Buttons for "Move Up", "Move Down", "Remove", and "Remove All" are located to the right of the list. Below the list is a text input field labeled "Edit or Add Component" and an "Add" button, which is highlighted with a red box. At the bottom of the dialog box, the "OK" button is also highlighted with a red box. A context menu is visible over the "Add Component..." button in the left sidebar, listing options: "Edit (Ctrl+E)", "Physical Properties Options", "Convert", "Copy", and "Properties". The "Simulation Messages" window is visible at the bottom of the main interface.

Ready | local | Dynamic at 0.0



Aspen Chromatography - Untitled

File Edit View Tools Flowsheet Run Window Help

Dynamic

Exploring - Simulation

All Items

- Chromatography
  - Chromatography
  - IonX
  - Models
  - Parameter Types
  - Port Types
  - Procedures
  - Scripts
  - Stream Types
  - Submodels\_Core
  - Submodels\_User

Contents of Stream Types

- chrom\_M...
- chrom\_r...
- chrom\_So...
- Connection
- ControlSi...
- ionx\_Mat...
- ionx\_r\_Ma...

Process Flowsheet Window

Grid 0.05

Simulation Messages

- B3.C(18,\*\*) - Failed path is (18,\*\*)
- B3.C(19,\*\*) - Failed path is (19,\*\*)
- B3.C(20,\*\*) - Failed path is (20,\*\*)

Validation complete

빈 문서 2 - 한글과컴퓨터 한글 local Dynamic at 0,0

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Aspen Chromatography - Untitled

File View Tools Run Window Help

Dynamic

Exploring - Simulation

Process Flowsheet Window

B3(Column) double click  
▶ 조건 기입

Configure Block/Stream B3

Configure Block/Stream B3

Configure Block/Stream B3

Table B3.Specify

	Value	Spec	Description	Units
Hb	7.46	Fixed	Height of adsorbent layer	cm
Db	1.6	Fixed	Internal diameter of adsorbent layer	cm
Ei	0.34965	Fixed	Inter-particle voidage	m <sup>3</sup> void/m <sup>3</sup> bed
Ep	0.0	Fixed	Intra-particle voidage	m <sup>3</sup> void/m <sup>3</sup> bed
Np(*)				
Np("Na")	300.0	Fixed	Number of plates	n/a
Np("Ovalbumin")	27.0	Fixed	Number of plates	n/a
MTC(*)				
MTC("Ovalbumin")	100000.0	Fixed	Constant mass transfer coefficients	1/min
Q	0.15	Fixed	Total Resin Capacity	eq/l
IP(*)				
IP(1,"Ovalbumin")	0.5	Fixed	Isotherm parameter	n/a
IP(2,"Ovalbumin")	2.64e-005	Fixed	Isotherm parameter	n/a
IP(3,"Ovalbumin")	-6.21	Fixed	Isotherm parameter	n/a

B3.C(20, ) = Failed pair is (20, )  
Validation complete

chrom\_M...  
Connection  
ionx\_r.Ma...

Variables Copy Print Help

Validation complete

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# Cycle Organizer double click

- ▶ [Step] → Add/Insert Step
- ▶ 각 step의 조건을 입력
- ▶ [Cycle] → [Generate cycle]

The screenshot displays the Aspen Chromatography software interface. The 'Tools' menu is open, showing various options including 'Cycle Organizer...'. The 'Cycle Organizer' dialog box is also open, showing the 'Cycle 1' configuration. The dialog box includes fields for 'Description', 'Control' (Time driven, Event driven, Value, Variable, Expression), and 'Other' (Step dependent). The 'Generate Cycle' button is visible at the bottom right of the dialog box. A blue arrow points from the 'Cycle Organizer...' menu item to the dialog box.

Aspen Chromatography - Untitled

File Edit View Tools Run Window Help

Explorer

Units of Measurement  
Custom Modeling

Snapshots... Ctrl+Shift+S  
Variable Find... Ctrl+F

Specification Analysis  
Homotopy...  
Simulation Access Extensions...  
Optimization...  
Estimation...  
On Line Links...

Estimation Module  
Cycle Organizer...  
Report

Pulse Test...  
New Plot...  
New Table...  
New Profile Plot...  
New History Table...  
New Profile Table...

Capture Screen Layout...  
Procedure Organizer...  
Generate Procedure Code...  
Prepare Export TMB Flowsheet...  
Export Compiled Flowsheet...  
Server Configuration...  
Settings...

Cycle Organizer

Cycle Step Print Help

Cycle 1

[Undefined]

Step 1 | Step 2 | Step 3

Control

Description [Undefined]

Time driven [60] min

Event driven [Undefined] >=

Value [0]

Variable [Undefined]

Expression [Undefined]

Other

Step dependent [None]

Ready Generate Cycle

Validating simulation...  
Validation complete  
Validating simulation...  
Validation complete

Ready local Dynamic at 0,0

각 step에 Component Drag  
▶ 각각 조건입력

The screenshot displays the Aspen Chromatography software interface. The main window shows a process flowsheet with a stream labeled 'S2' entering a unit 'B2'. A 'Variable Selector' dialog box is open, listing various simulation variables. A red arrow points from the selected variable 'B1.Component\_Concentration("Ovalbumin")' in the dialog to the 'Manipulated Variables' section of the 'Cycle Organizer' window. The 'Cycle Organizer' window shows 'Cycle 1' with 'Step 1' selected. The 'Simulation Messages' window at the bottom shows validation status.

**Variable Selector**

Quick find/filter

- B1.CompAccum("Na")
- B1.CompAccum("Ovalbumin")
- B1.Component\_Concentration("Na")
- B1.Component\_Concentration("Ovalbumin")
- B1.Flowrate
- B1.Pressure
- B1.VolAccum
- B2.CompAccum("Na")
- B2.CompAccum("Ovalbumin")
- B2.VolAccum
- B3.C(1,"Ovalbumin")
- B3.C(10,"Ovalbumin")
- B3.C(11,"Ovalbumin")
- B3.C(12,"Ovalbumin")
- B3.C(13,"Ovalbumin")
- B3.C(14,"Ovalbumin")

Select Cancel

**Cycle Organizer**

Cycle Step Variable Print Help

Cycle 1

[Undefined]

Step 1 | Step 2 | Step 3 |

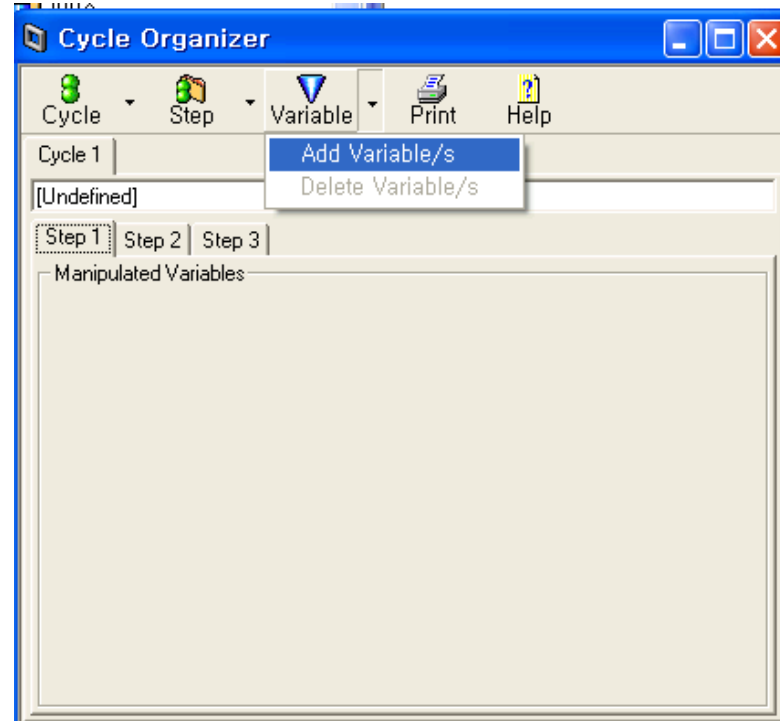
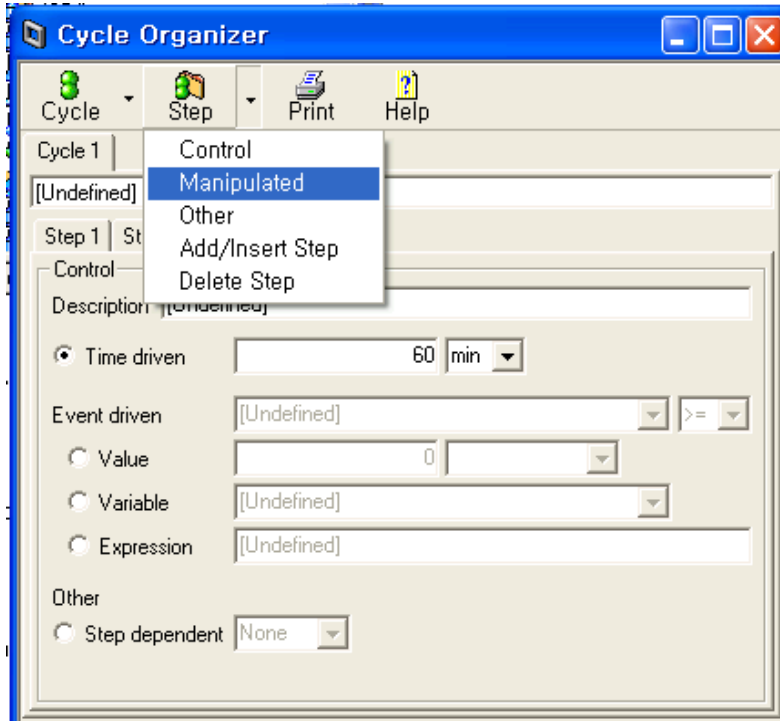
Manipulated Variables

Ready Generate Cycle

**Simulation Messages**

Validating simulation...  
Validation complete  
Validating simulation...  
Validation complete

Ready local Dynamic at 0.0



**Cycle Organizer**

Cycle Step Variable Print Help

Cycle 1

[Undefined]

Step 1 | Step 2 | Step 3

Manipulated Variables

Variable	Value	Units	Spec	Ramped	Target	Time (min)
B1.Component_Concentration("Na")	0.02	M	Fixed	No		
B1.Component_Concentration("Ovalbumin")	0.143	meq/l	Fixed	No		

**Cycle Organizer**

Cycle Step Variable Print Help

Cycle 1

[Undefined]

Step 1 | Step 2 | Step 3

Manipulated Variables

Variable	Value	Units	Spec	Ramped	Target	Time (min)
B1.Component_Concentration("Na")	0.02	M	Fixed	No		
B1.Component_Concentration("Ovalbumin")	0.0	meq/l	Fixed	No		

**Cycle Organizer**

Cycle Step Variable Print Help

Cycle 1

[Undefined]

Step 1 | Step 2 | Step 3

Manipulated Variables

Variable	Value	Units	Spec	Ramped	Target	Time (min)
B1.Component_Concentration("Na")	0.5	M	Fixed	Linear	0.5	60
B1.Component_Concentration("Ovalbumin")	0.0	meq/l	Fixed	No		

Exploring - Simulation

All Items

- Simulation
  - Flowsheet
  - Chromatography
    - Chromatography
    - IonX
    - Models
    - Parameter Types
    - Port Types
    - Procedures
    - Scripts
    - Stream Types

Contents of Flowsheet

- Add Form
- Add Script
- Add Task
- Blocks
- Flowsheet
- LocalVari...
- Streams

Process Flow

Table과 graph 그리기  
1. Table 그리기

Add Form Instance

Name: Ovalbumin

Available Form Definitions:

- Table
- Plot
- Profile plot
- History table
- Profile table
- Custom OCX...

OK Cancel

The screenshot displays the Aspen Chromatography software interface. The main window shows a process flow diagram with a central distillation column (B3) and two feed streams (B1 and B2) connected via streams S1 and S2. A context menu is open over the diagram, listing various simulation and analysis options. The status bar at the bottom indicates the simulation is ready and dynamic.

**Aspen Chromatography - Untitled**

File Edit View Tools Run Window Help

Explorer

- Units of Measurement
- Custom Modeling
- Snapshots... Ctrl+Shift+S
- Variable Find... Ctrl+F
- Specification Analysis...
- Homotopy...
- Simulation Access Extensions...
- Optimization...
- Estimation...
- On Line Links...
- Estimation Module
- Cycle Organizer...
- Report
- Pulse Test...
- New Plot...
- New Table...
- New Profile Plot...
- New History Table...
- New Profile Table...
- Capture Screen Layout...
- Procedure Organizer...
- Generate Procedure Code...
- Prepare Export TMB Flowsheet...
- Export Compiled Flowsheet...
- Server Configuration...
- Settings...

Sheet Window

Validating simulation...  
Validation complete  
Validating simulation...  
Validation complete

Search for variables in this simulation Ready local Dynamic at 0.0

Aspen Chromatography - Untitled

File Edit View Tools Run Window Help

Dynamic

Exploring - Simulation Process Flowsheet Window

All Items

Simulation

Flowsheet

History Tab

Time

Minutes

Blocks Flowsheet

Ovalbumin Streams

**Variable Find**

Variable:

Find in: B2

Specification  Free  Fixed  Initial  RateInitial

Value: =

Variable

Only Show Variables with History Record On

Only Show Variables which have a Tag

Include Algebraic Variables  Include Inactive Variables

Include State Variables  Include Parameters

Name	Value	Sp...	Variable Type	Description	Tag
B2,CompAccum("Na")	0,0	Init..	i_Holdup_Eq	Mass of component received...	
B2,CompAccum("Ovalbumin")	0,0	Init..	i_Holdup_Eq	Mass of component received...	
B2,CompConcAccum("Na")	0,0	Free	i_Conc_Eq	Average concentration of eac...	
B2,CompConcAccum("Ovalbumin")	0,0	Free	i_Conc_Eq	Average concentration of eac...	
B2,CompFraction("Na")	0,0	Free	Fraction	Average mass fraction of co...	
B2,CompFraction("Ovalbumin")	0,0	Free	Fraction	Average mass fraction of co...	
B2,Concentration("Na")	0,5	Free	i_Conc_Eq	Sink component concentration	
<b>B2,Concentration("Ovalbumin")</b>	0,0	Free	i_Conc_Eq	Sink component concentration	
B2,Flowrate	0,005	Free	i_Flow_Volume	Sink flowrate	
B2,Pressure	20,0	Free	Pressure	Sink pressure	
B2,Process_In,C("Na")	0,5	Free	i_Conc_Eq	Material concentration	
B2,Process_In,C("Ovalbumin")	0,0	Free	i_Conc_Eq	Material concentration	
B2,Process_In,F	0,005	Free	i_Flow_Volume	Total volumetric flowrate	
B2,Process_In,P	20,0	Free	Pressure	Pressure	
B2,Run_Time_Mode	5,0	Free	Positive	Current run mode	
B2,TotConcentration	0,5	Free	i_Conc_Eq	Total concentration of the inle...	
B2,TotCompAccum	0,0	Free	i_Holdup_Eq	Total mass of components re...	
B2,VolAccum	0,0	Init..	i_Holdup_Volume	Volume of material received f...	
B2,X("Na")	100,0	Free	Fraction	Material fraction of inlet material	
B2,X("Ovalbumin")	0,0	Free	Fraction	Material fraction of inlet material	

Ready local Dynamic at 0,0

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Aspen Chromatography - Untitled

File Edit View Tools Run Window Help

Dynamic

Exploring - Simulation Process Flowsheet Window

All Items

Simulation

Flowsheet

History Table Ovalbumin

Time	B2.Concentration("Ovalbumin")
Minutes	eq/l

Copy Ctrl+C

Refresh Ctrl+W

Delete Variable

Show Table as Plot

Properties Alt+Enter

Reset form properties

Export Table

Profile Variables... Alt+A

Autosize columns

Step change data

Plot Ovalbumin

Ovalbumin

B2.Concentration("Ovalbumin") eq/l

Time Minutes

Simulation Messages

Validating simulation...

Validation complete

Validating simulation...

Validation complete

Shows this table as a plot

Ready local Dynamic at 0,0

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Table과 graph 그리기  
2. graph 그리기



Aspen Chromatography - Untitled

File View Tools Run Window Help

Initialization

Exploring - Simulation

Process Flowsheet Window

All Items

Simulation

Flowsheet

History Table Ovalbumin

Time	B2.Concentration("Ovalbumin")
Minutes	eq/l
0.0	0.0

Run complete

The run has completed

확인

Plot Ovalbumin

Ovalbumin

B2.Concentration("Ovalbumin") eq/l

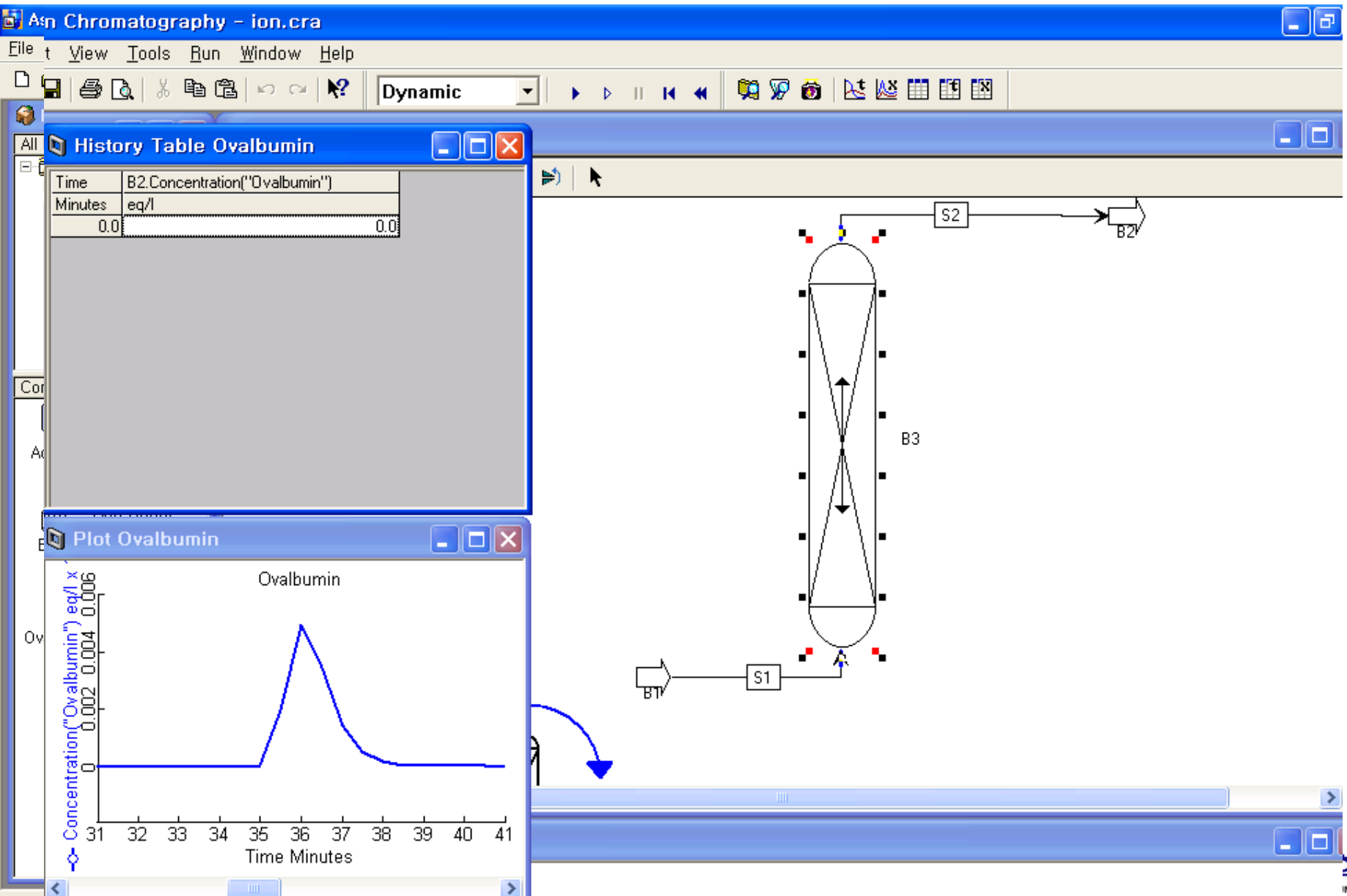
Time Minutes

Messages

Files have been saved to file snpA0001.snp

16:39:41

Running local Initialization



# Reversed Phase Chromatography

Explorin... Process Flowsheet Window

All Items

- Simulation
  - Flowsheet
  - Chromatography
  - SystemLibrary
  - Component Lists

Contents of Component Lists

Add Compon...

- Edit (Ctrl+E)
- Physical Properties Options
- Convert
- Copy
- Properties

Process Flowsheet Window

Grid 0.05

Build Component Set - Default

Components

Name
Adenine
Cytosine

Move Up

Move Down

Remove

Remove All

Edit or Add Component

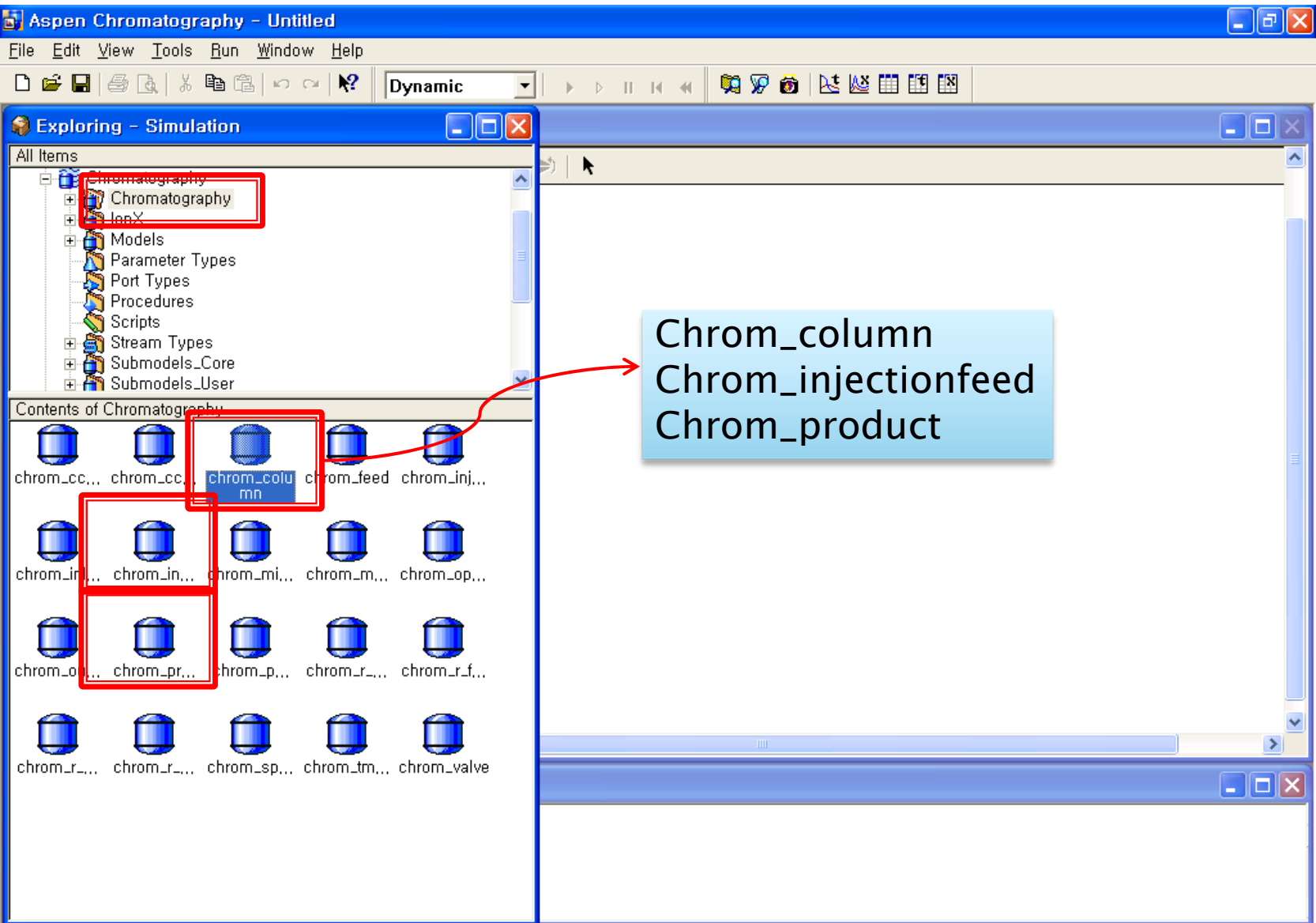
Add

Edit

OK

Cancel

Simulation Messages



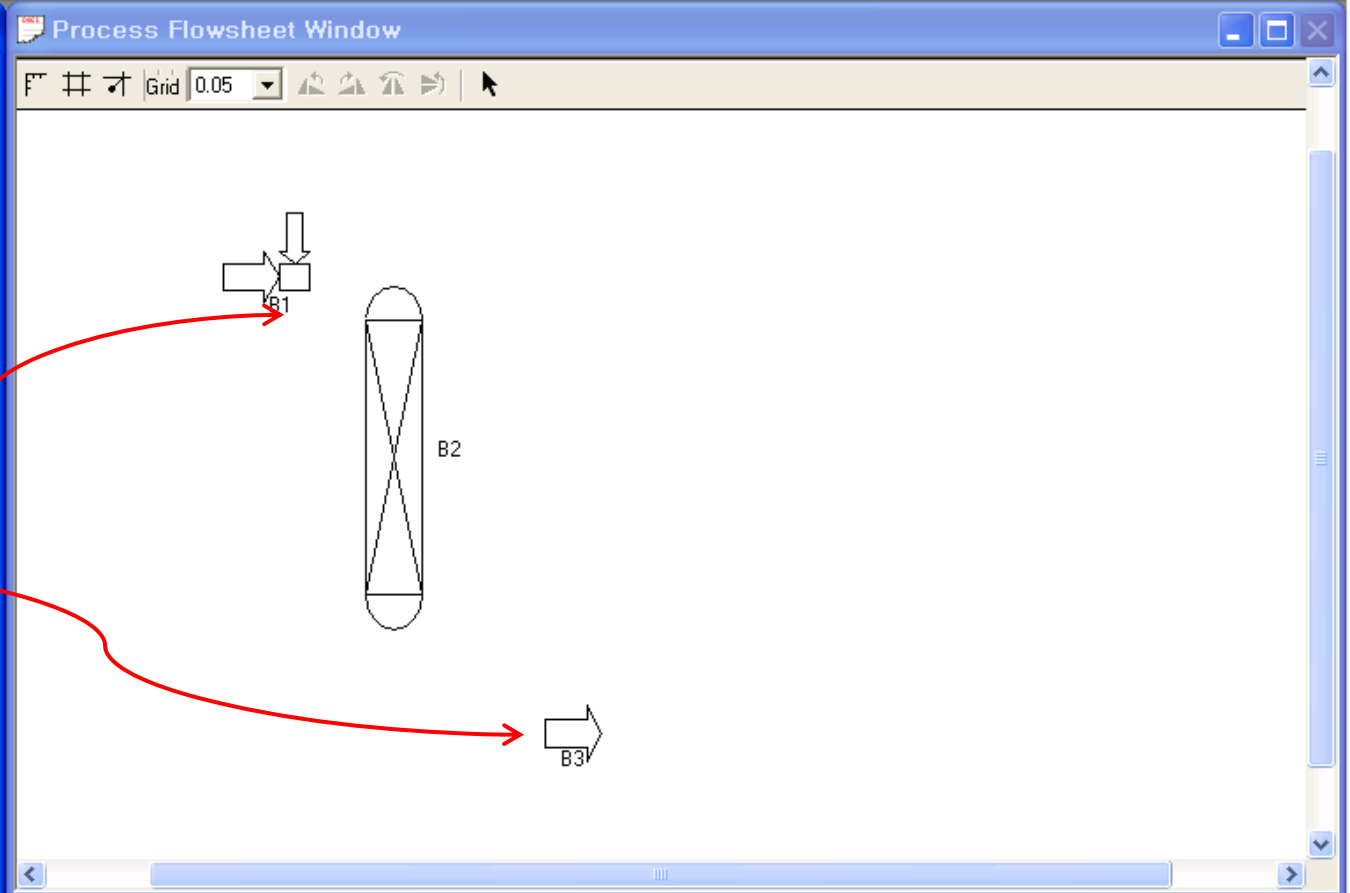
Exploring - Simulati...

All Items

- Chromatography
  - Chromatography
  - IonX
  - Models
  - Parameter Types
  - Port Types
  - Procedures
  - Scripts
  - Stream Types**
  - Submodels\_Core
  - Submodels\_User

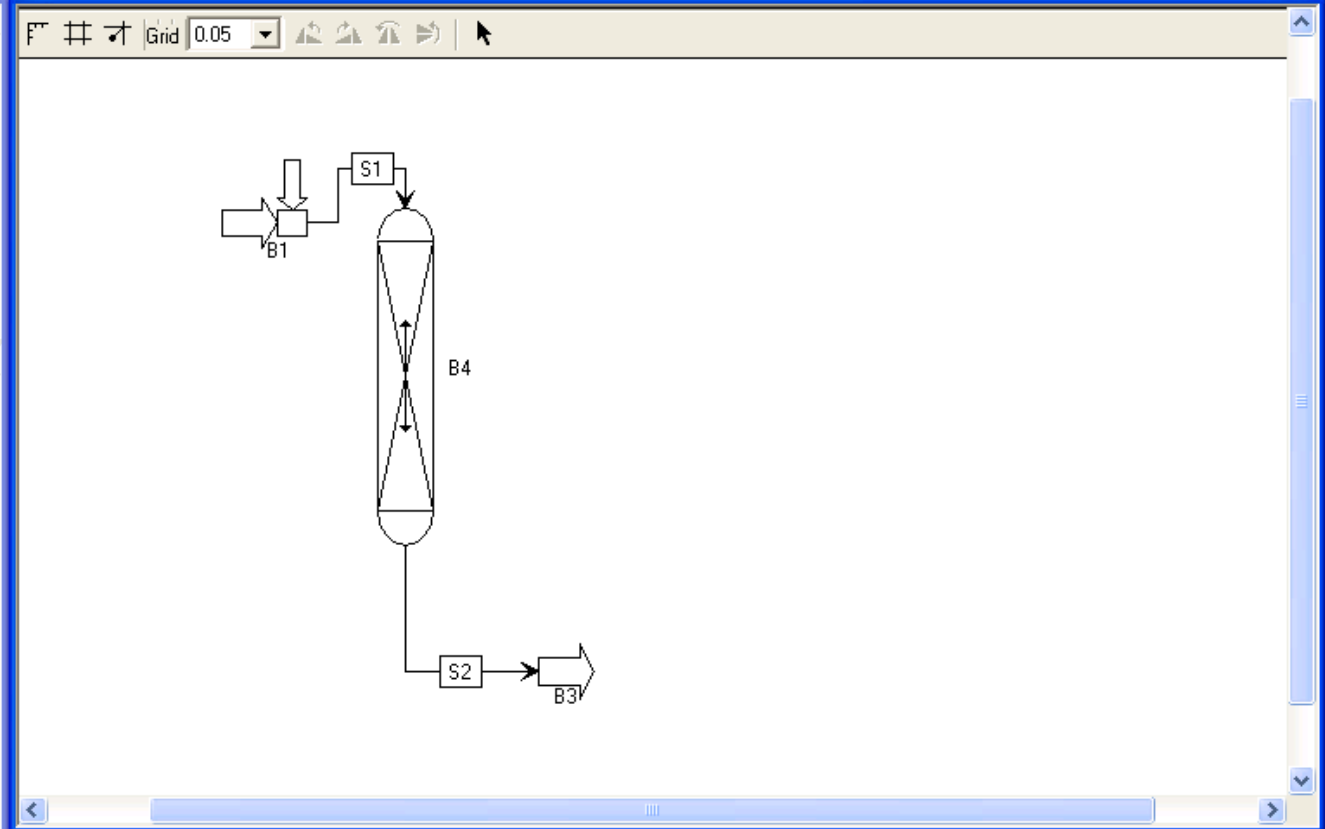
Contents of Stream Types

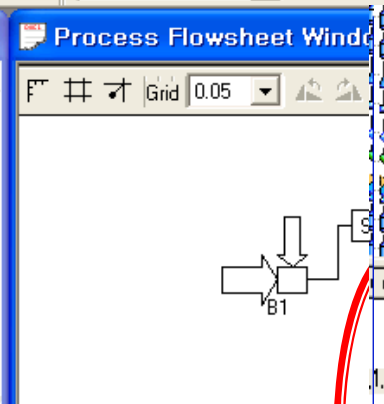
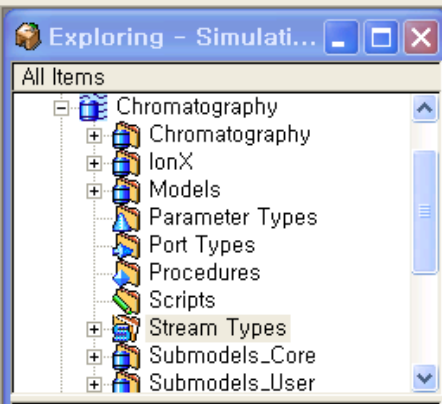
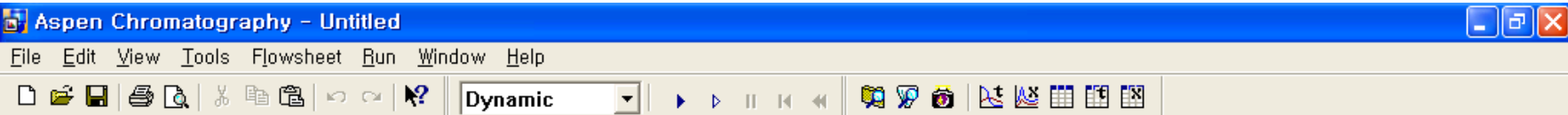
- chrom\_Material\_Connection
- chrom\_r...
- chrom\_So...
- Connection
- ControlSi...
- ionx\_Mat...
- ionx\_r\_Ma...



- All Items
- Chromatography
    - Chromatography
    - IonX
    - Models
    - Parameter Types
    - Port Types
    - Procedures
    - Scripts
    - Stream Types
    - Submodels\_Core
    - Submodels\_User

- Contents of Stream Types
- chrom\_M...
  - chrom\_r...
  - chrom\_So...
  - Connection
  - ControlSi...
  - ionx\_Mat...
  - ionx\_r\_Ma...





### Configure Block/Stream B4

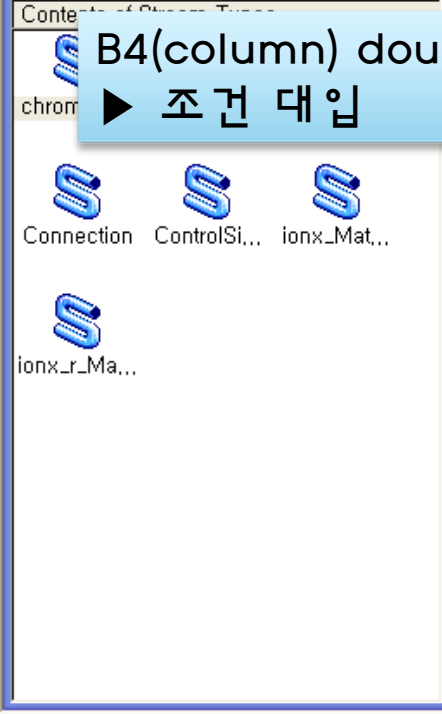
Variables Copy Print Help

General | Material Balance | Kinetic Model | Isotherm | Procedures | **Specify**

Isotherm Form Assumed: Linear

Buttons: Presets/Initials, Initialize, Results, Open, Save, Help

B4(column) double click  
▶ 조건 대입



### Table B4.Specify

	Value	Spec	Description	Units
Hb	15.0	Fixed	Height of adsorbent layer	cm
Db	0.39	Fixed	Internal diameter of adsorbent layer	cm
Ei	0.374	Fixed	Inter-particle voidage	m3 void/m3 bed
Ep	0.0	Fixed	Intra-particle voidage	m3 void/m3 bed
Np(*)				
Np("Adenine")	1150.0	Fixed	Number of plates	n/a
Np("Cytosine")	20000.0	Fixed	Number of plates	n/a
MTC(*)				
MTC("Adenine")	200.0	Fixed	Constant mass transfer coefficient	1/min
MTC("Cytosine")	100.0	Fixed	Constant mass transfer coefficient	1/min
IP(*)				
IP(1,"Adenine")	1.67	Fixed	Isotherm parameter	n/a
IP(1,"Cytosine")	0.52	Fixed	Isotherm parameter	n/a
IP(2,"Adenine")	0.0	Fixed	Isotherm parameter	n/a
IP(2,"Cytosine")	0.0	Fixed	Isotherm parameter	n/a



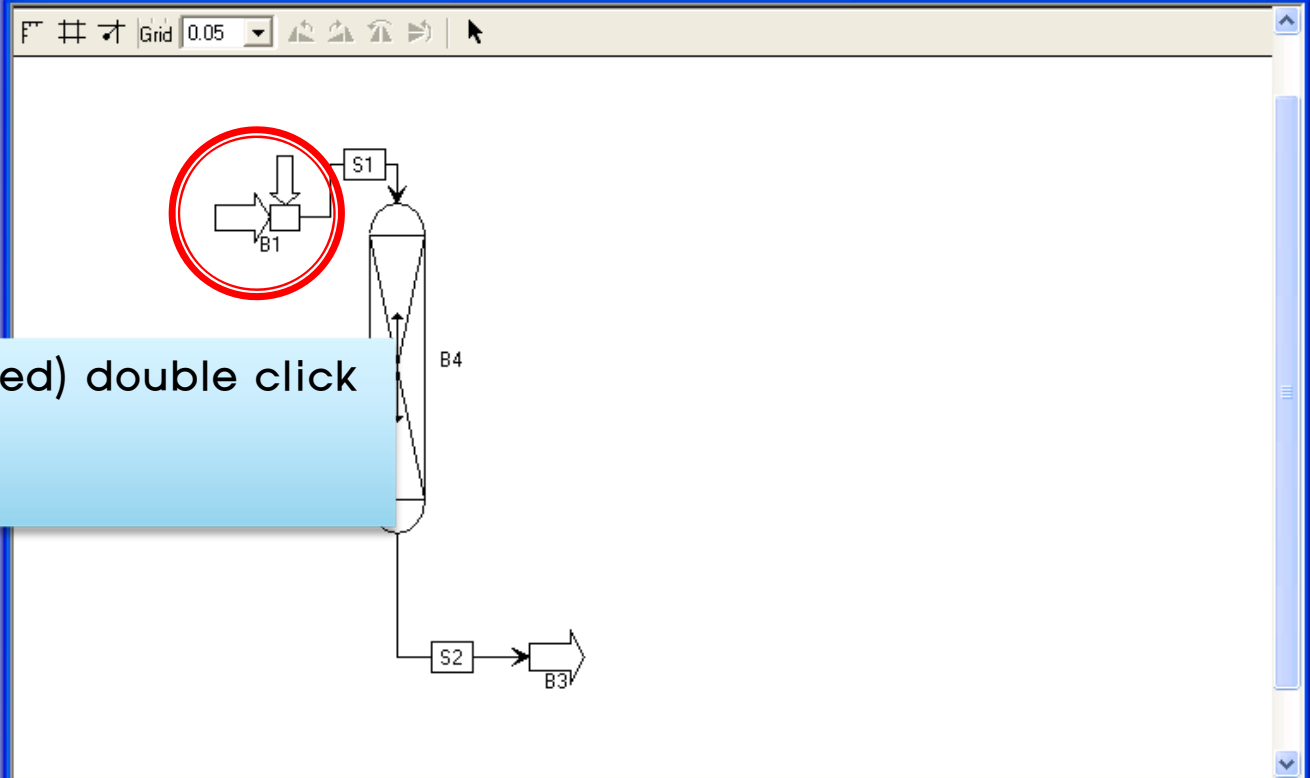
Aspen Chromatography - Untitled

File Edit View Tools Flowsheet Run Window Help

Dynamic

Exploring - Simulati...  
All Items  
Chromatography  
Chromatography  
IonX  
Models  
Parameter Types  
Port Types  
Procedures  
Scripts  
Stream Types  
Submodels\_Core  
Submodels\_User

Process Flowsheet Window



B1(Injector feed) double click  
▶ 조건 대입  
▶ [specify]

Contents of:  
chrom\_M...  
Connection  
ControlSi...  
ionx\_Mat...  
ionx\_r\_Ma...

Table B1.Specify

	Value	Spec	Description	Units
Eluent_Flowrate	0.5	Fixed	Constant eluent feed rate	ml/min
Eluent_Pressure	174.0	Fixed	Eluent feed pressure	atm
Inject_Volume	20.0	Fixed	Volume of material injected	ul
Inject_Comp_Concentration(*)				
Inject_Comp_Concentration("Adenine")	0.5	Fixed	Component concentrations of the injected	g/l
Inject_Comp_Concentration("Cytosine")	0.5	Fixed	Component concentrations of the injected	g/l

Aspen Chromatography - Untitled

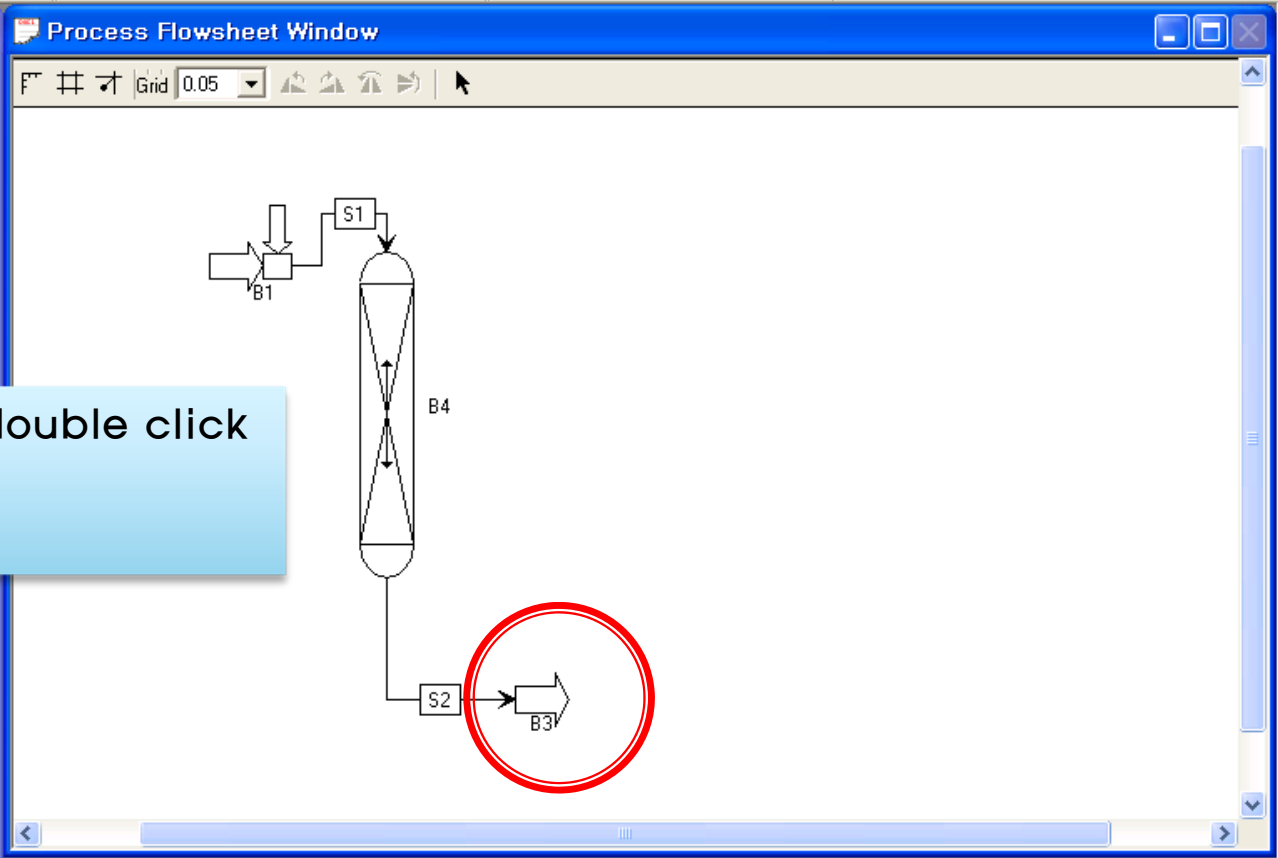
File Edit View Tools Flowsheet Run Window Help

Dynamic

Exploring - Simulati...

All Items

- Chromatography
  - Chromatography
  - IonX
  - Models
  - Parameter Types
  - Port Types
  - Procedures
  - Scripts
  - Stream Types
  - Submodels\_Core
  - Submodels\_User



B3(Product) double click

- ▶ 조건 대입
- ▶ [specify]

Contents of

- chrom\_M...
- Connection
- ControlSI...
- ionx\_Mat...
- ionx\_r\_Ma...

Table B3.Specify

	Value	Spec	Description	Units
Flowrate	0.5	Free	Sink flowrate	ml/min
Pressure	174.0	Free	Sink pressure	atm

All Items

- Chromatography
  - Chromatography
  - IonX
  - Models
  - Parameter Types
  - Port Types
  - Procedures
  - Scripts
  - Stream Types
  - Submodels\_Core
  - Submodels\_User

Contents of Stream Types

chrom\_M... chrom\_r... chrom\_So...

Connection ControlSI... ionx\_Mat...

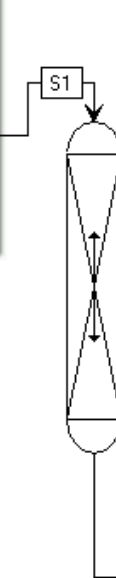
ionx\_r\_Ma...

Mode

- Run F5
- Step F11
- Pause F4
- Pause At... Ctrl+F5
- Restart F7
- Rewind... F6
- Reset Ctrl+F7
- Run Options...
- Solver Options...**
- Unload User DLLs...
- Interrupt

Simulation Messages

Validating simulation...  
Validation complete



### Solver Properties

Non Linear Solver	Estimator	Optimizer	Homotopy
Diagnostics	Tolerances	Tearing	Integrator
			Linear Solver

Name: Variable Step Implicit Euler

Initial integration step: Implicit Euler

Minimum integration step: Variable Step Implicit Euler

Maximum integration step: Euler

Step reduction factor: 0,5

Maximum step increment factor: 1,5

Absolute integration error tolerance: 0,0001

Tear integration error tolerance: 0,01

Maximum corrector iterations: 500

Show highest integration: 0

Use Interpolation

Reconverge Torn Variables

Buttons: 확인, 취소, 적용(A), 도움말

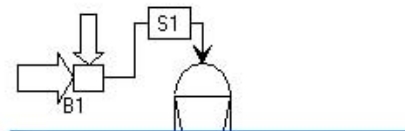
- All Items
- Simulation
  - Flowsheet
  - Chromatography
    - IonX
    - Models
    - Parameter Types
    - Port Types
    - Procedures
    - Scripts
    - Stream Types

Add Form (highlighted)

Add Script Add Task

Blocks Flowsheet LocalVari...

Streams



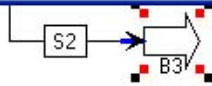
Add Form Instance

Name AdCy

Available Form Definitions

- Table
- Plot
- Profile plot
- History table (highlighted)
- Profile table
- Custom OCX...

OK Cancel



Validating simulation...  
Validation complete

Time	B3.Concentr	B3.Co
Minutes	g/l	g/l

### Variable Find

Variable:

Find in:

Specification  Free  Fixed  Initial  RateInitial

Value:

Variable

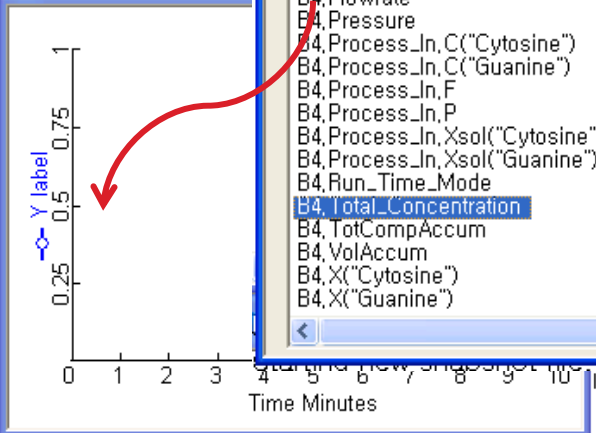
Only Show Variables with History Record On

Only Show Variables which have a Tag

Include Algebraic Variables  Include Inactive Variables

Include State Variables  Include Parameters

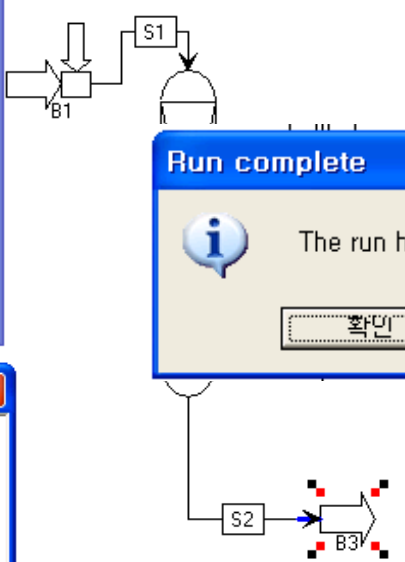
Name	Value	Sp...	Variable Type	Description	T:
B4.CompConcAccum("Cytosine")	0,0	Free	c_Conc_Mass	Average concentration of eac...	
B4.CompConcAccum("Guanine")	0,0	Free	c_Conc_Mass	Average concentration of eac...	
B4.CompFraction("Cytosine")	0,0	Free	Fraction	Average mass fraction of co...	
B4.CompFraction("Guanine")	0,0	Free	Fraction	Average mass fraction of co...	
B4.Concentration("Cytosine")	-8,7318e-016	Free	c_Conc_Mass	Sink component concentration	
B4.Concentration("Guanine")	-1,56538e-023	Free	c_Conc_Mass	Sink component concentration	
B4.Flowrate	5,e-004	Free	c_Flow_Volume	Sink flowrate	
B4.Pressure	174,0	Free	Pressure	Sink pressure	
B4.Process_In,C("Cytosine")	-8,7318e-016	Free	c_Conc_Mass	Material concentration	
B4.Process_In,C("Guanine")	-1,56538e-023	Free	c_Conc_Mass	Material concentration	
B4.Process_In,F	5,e-004	Free	c_Flow_Volume	Total volumetric flowrate	
B4.Process_In,P	176,306	Free	Pressure	Pressure	
B4.Process_In,Xsol("Cytosine")	0,5	Free	MassFraction	Solvent mass fraction	
B4.Process_In,Xsol("Guanine")	0,5	Free	MassFraction	Solvent mass fraction	
B4.Run_Time_Mode	1,0	Free	Positive	Current run mode	
B4.Total_Concentration	0,0	Free	c_Conc_Mass	Total concentration of the inle...	
B4.TotCompAccum	0,0	Free	c_Holdup_Mass	Total mass of components re...	
B4.VolAccum	0,0	Init..	c_Holdup_Volu...	Volume of material received f...	
B4.X("Cytosine")	0,0	Free	Fraction	Material fraction of inlet material	
B4.X("Guanine")	0,0	Free	Fraction	Material fraction of inlet material	



Dynamic  
**Initialization**  
Steady State  
Dynamic Estimation  
Optimization

History Table AdCy

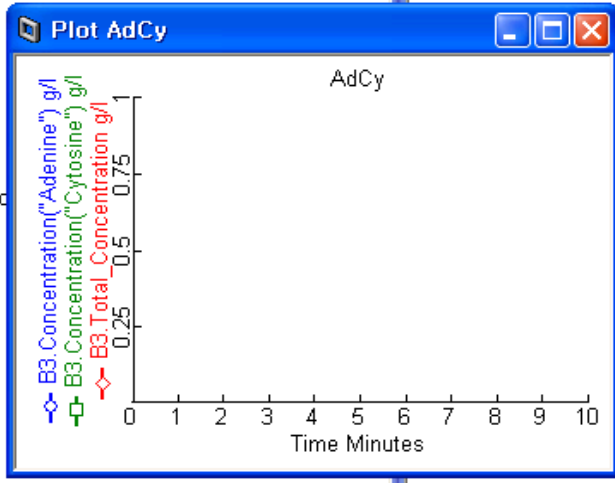
Time Minutes	B3.Concentri g/l	B3.Concentri g/l	B3.Total_Cc g/l



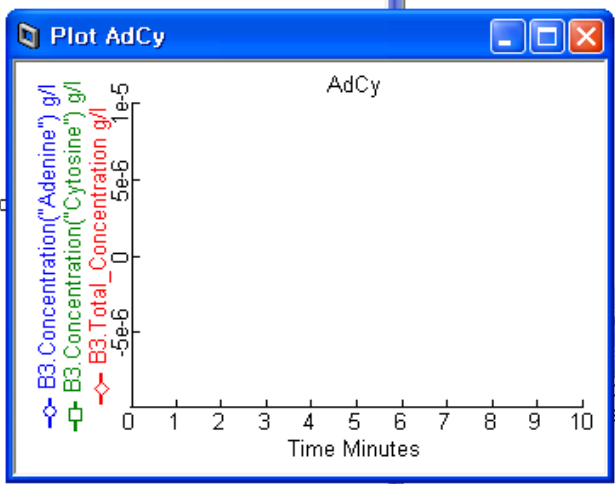
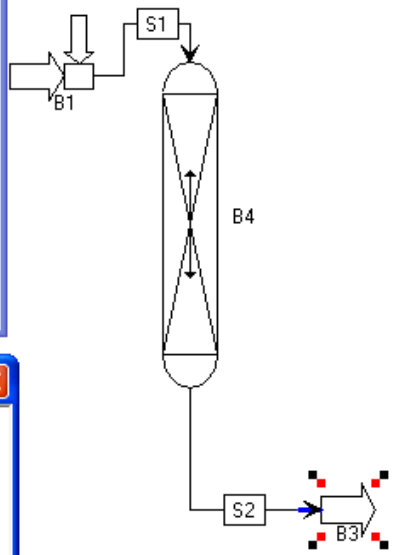
**Run complete**

The run has completed

확인



Time	B3.Concentration("Adenine")	B3.Co
Minutes	g/l	g/l
0.0		0.0



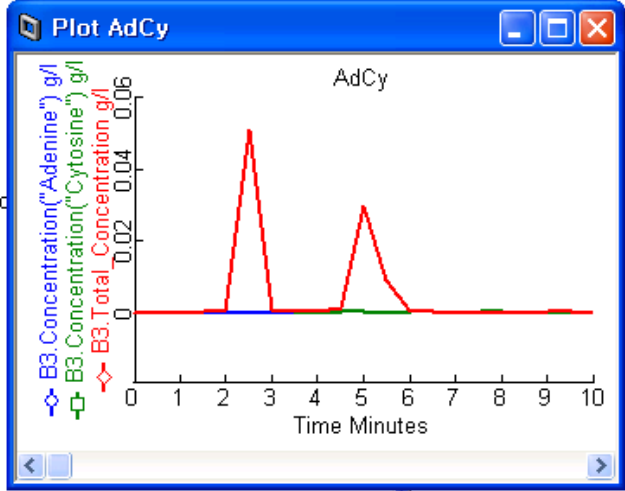
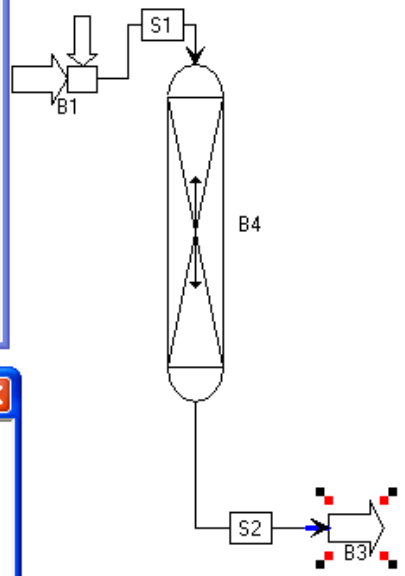
Messages

... have been saved to file snpA0005.snp

17:29:06

History Table AdCy

Time	B3.Concentration("Adenine")	B3.Concentration("Cyt
Minutes	g/l	g/l
0.0	0.0	0.0



Messages

232.5 to 233  
 233 to 233.5  
 233.5 to 234  
 7:30:19



## ▶ IEC vs RP.

IEC	RP
lonx_r_column lonx_feed lonx_product	Chrom_column Chrom_Injectionfeed Chrom_product
[Isotherm]- Yamamoto	Lear
	[Run]-[solver option]-[Integrator]- gear
[Dynamic] 하기전에 Column의 상태를	'0' 으로 바꿔야 한다.