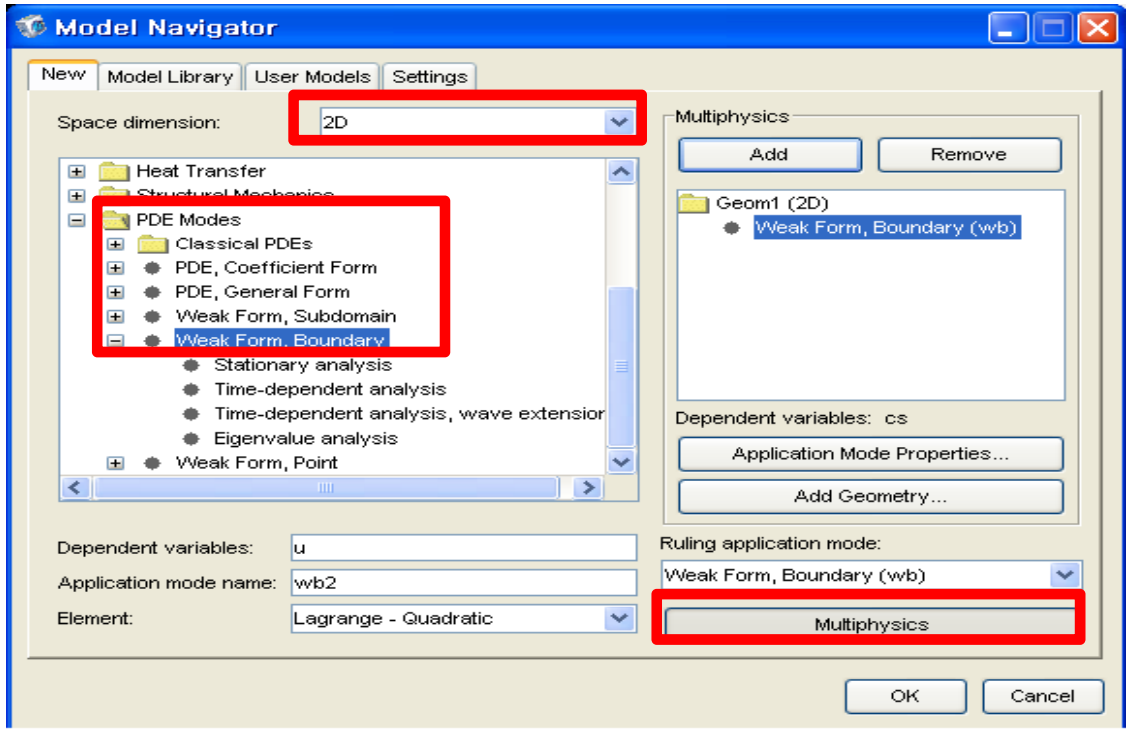
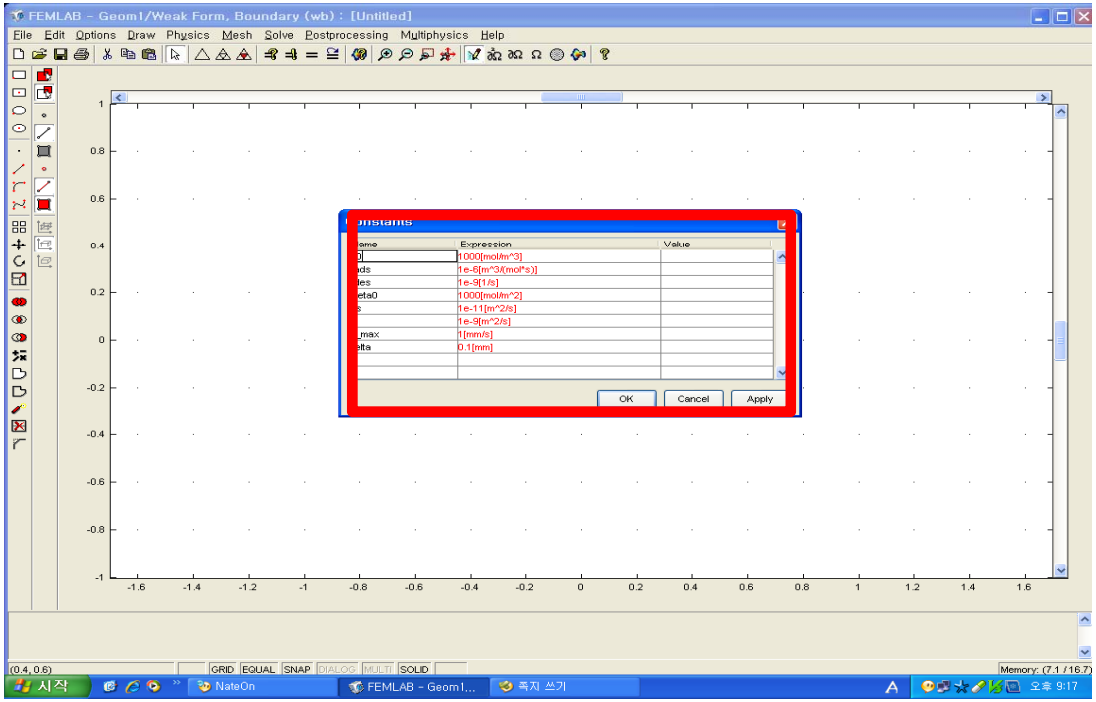
FEMLAB 을 이용한 흡착과 열분해 Modeling.

1. Transport and Adsorption



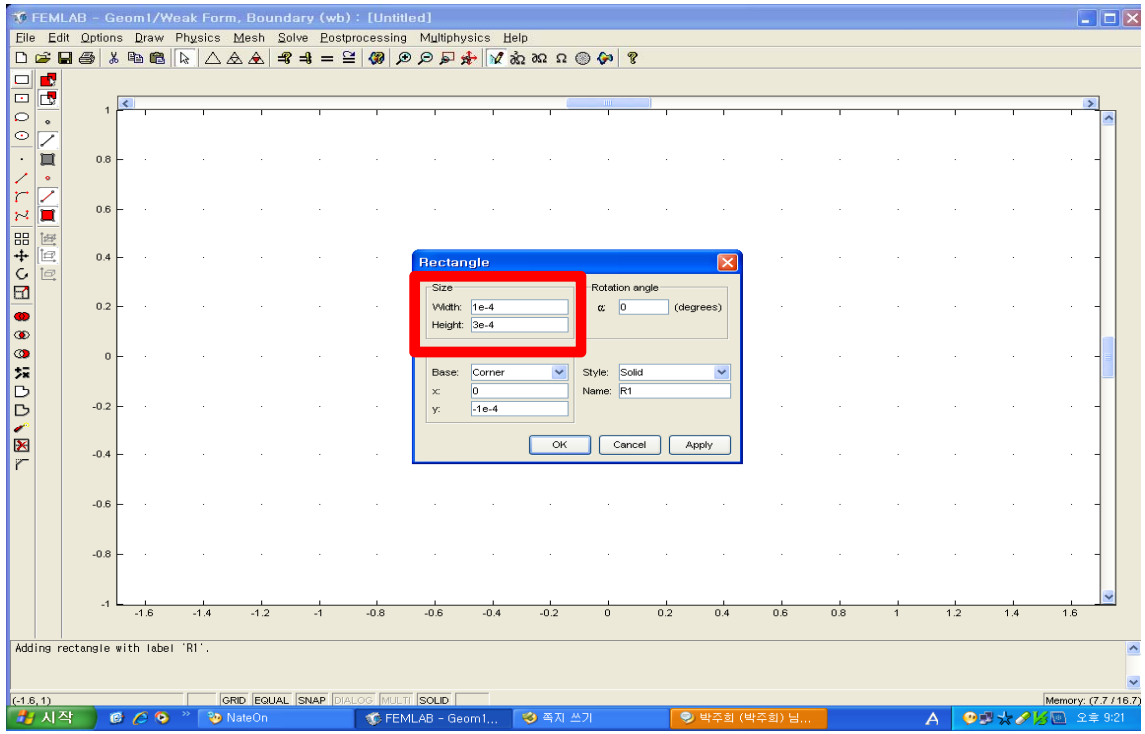
1. Comsol multiphysics > PDE modes > Weak Form, Boundary 선택
2. Comsol multiphysics > Convection and Diffusion < Convection and Diffusion > Transient 를 선택
3. Dependent variables 를 cs로 변경하고 Add 를 선택

1. Transport and Adsorption



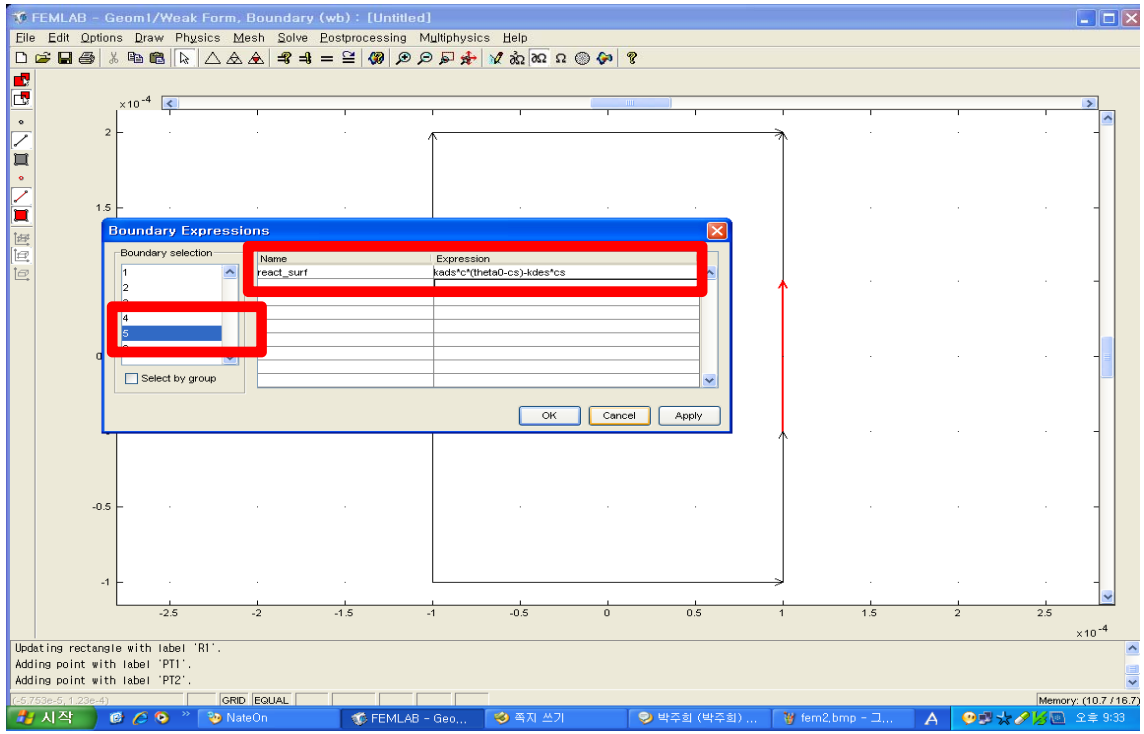
1. Option > Constants 를 선택하고, 값을 입력한 후 OK 를 클릭

1. Transport and Adsorption



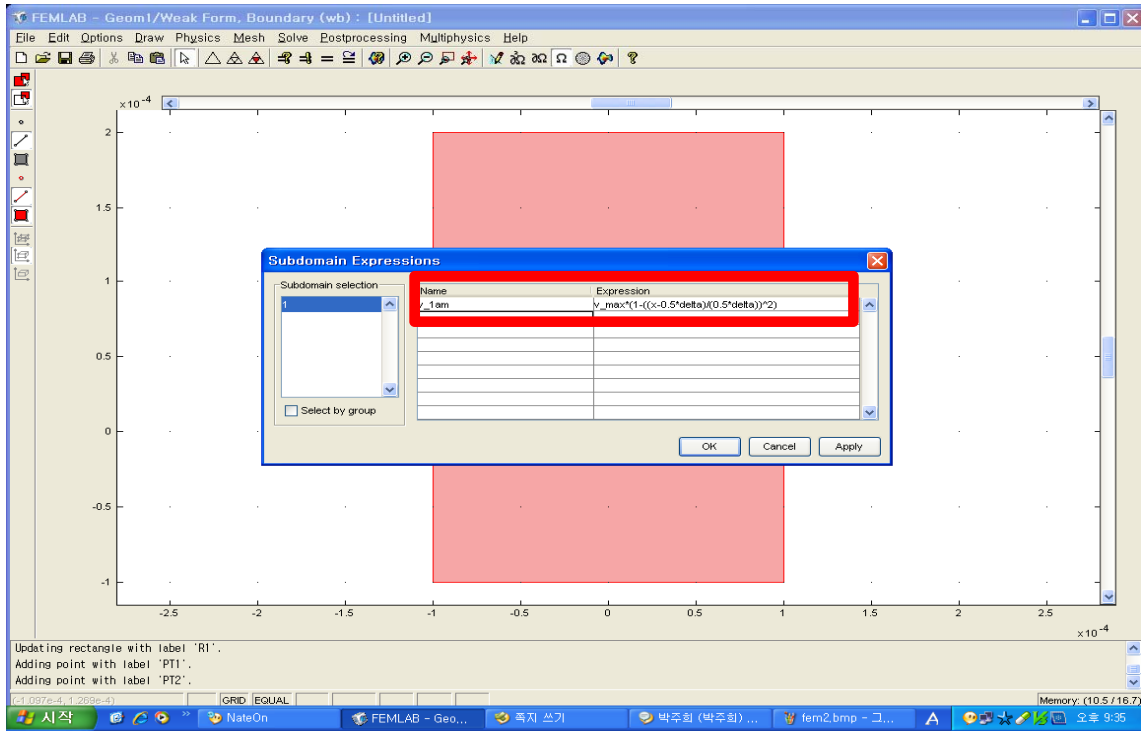
1. <shift>+Rectangle/Square 을 선택하고, 값을 입력한 후 OK를 클릭

1. Transport and Adsorption



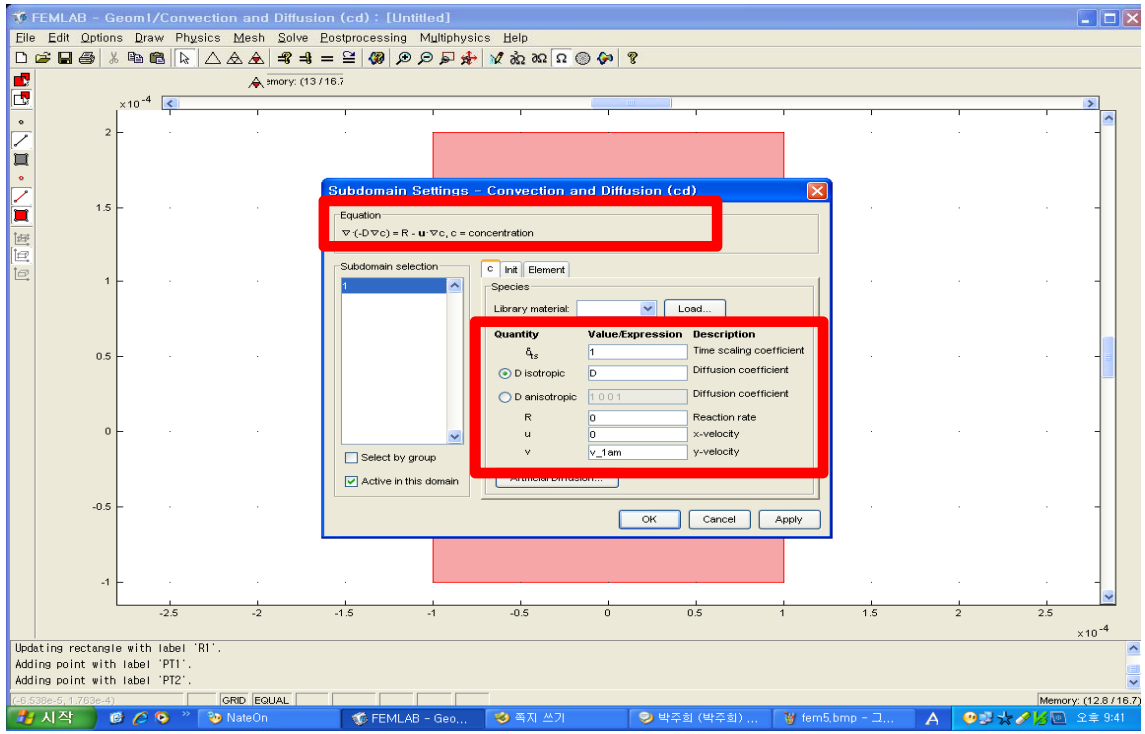
1. Option > Expressions > Boundary Expressions 을 선택.
2. 5번 경계를 선택하고, 반응식을 나타내는 값을 입력.

1. Transport and Adsorption



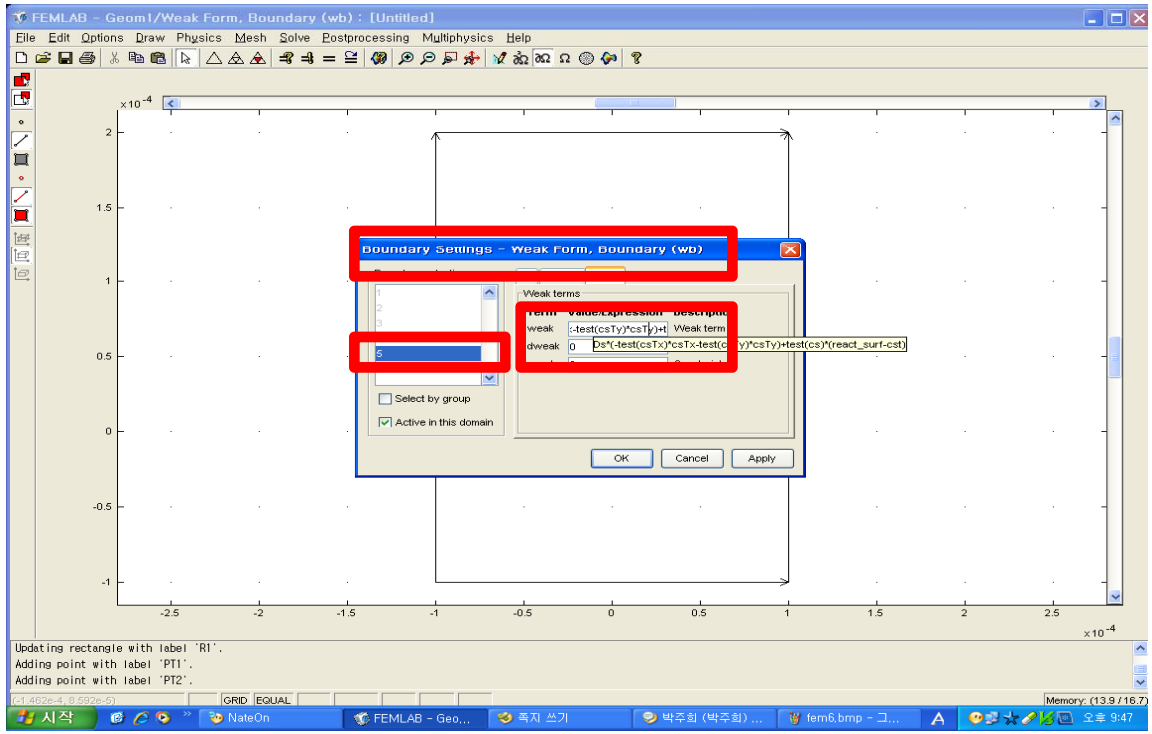
1. Option > Expressions > Subdomain Expressions을 선택.
2. 1번 도메인을 선택하고, 유체식을 나타내는 값을 입력.

1. Transport and Adsorption



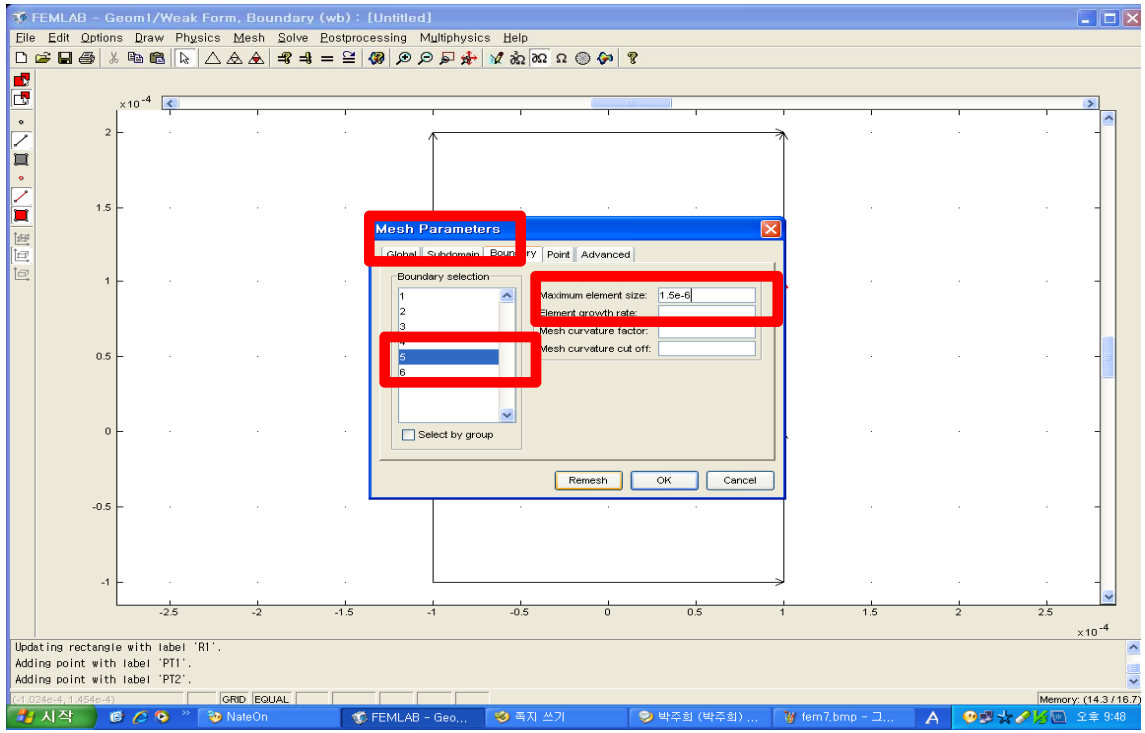
1. Physics > Boundary Setting 을 선택하고, 값을 입력한 다음 OK 클릭

1. Transport and Adsorption



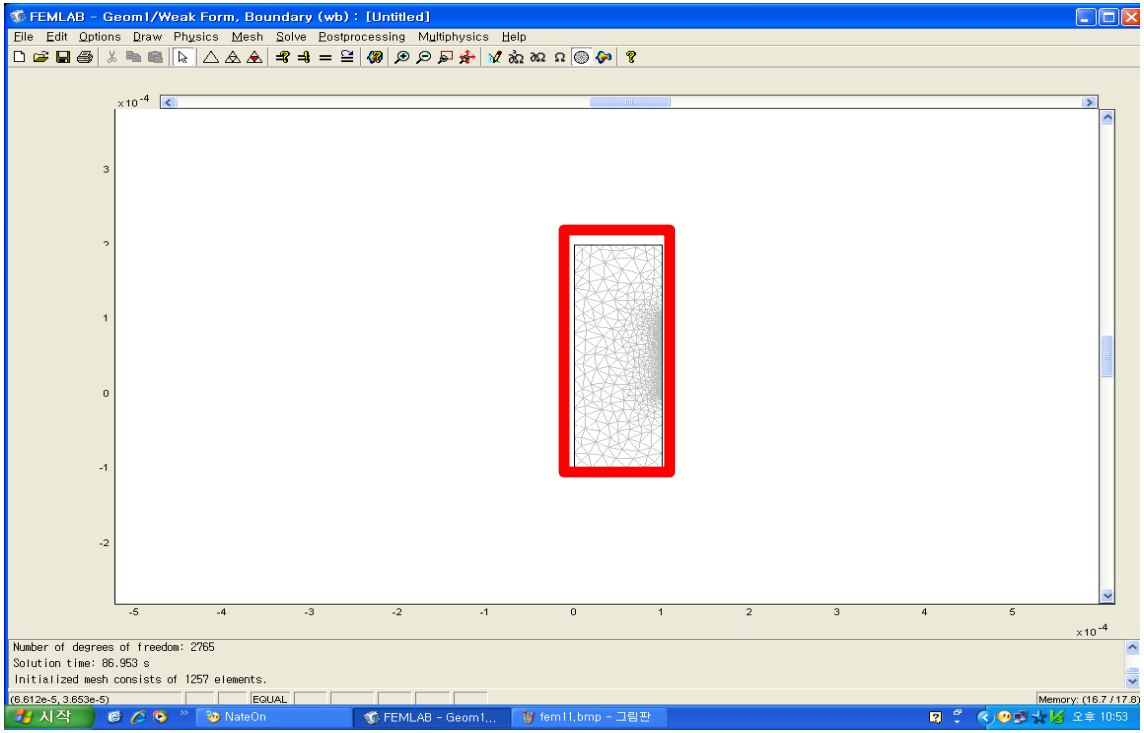
1. Multiphysics > Weak Form, Boundary 를 선택.
2. Physics >Boundary Setting 을 선택하고, Init 탭과 Weak 탭에 값을 입력한 다음 OK 클릭.

1. Transport and Adsorption



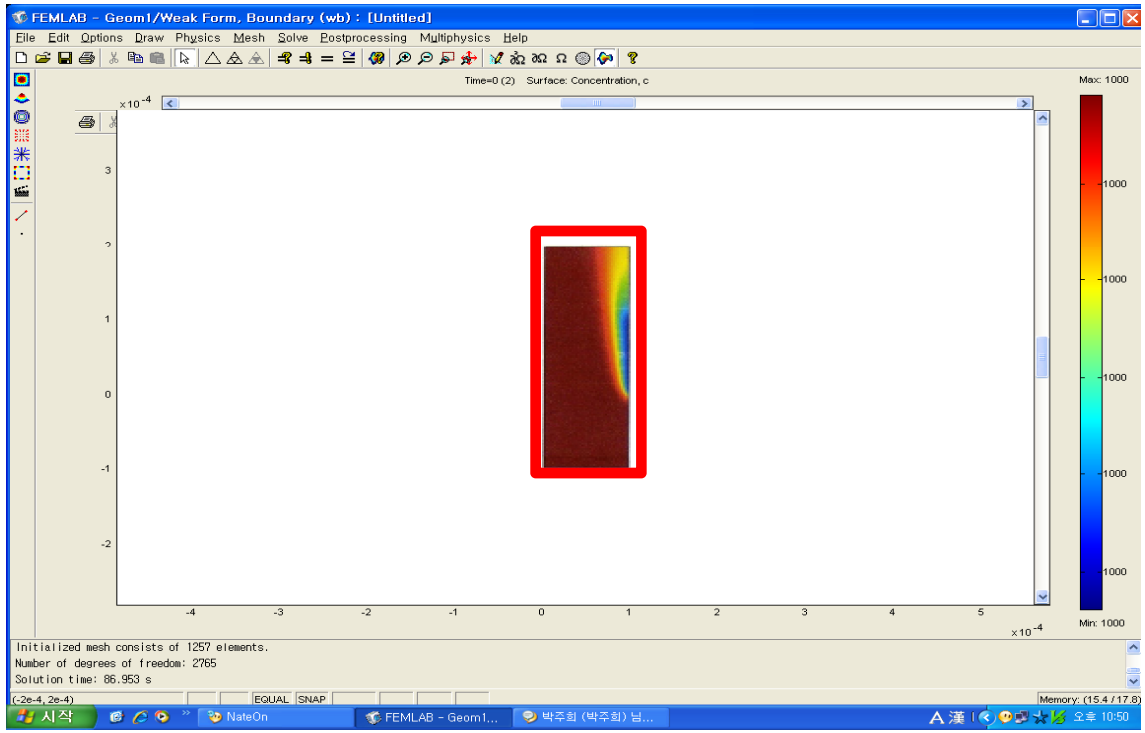
1. Mesh > Free Mesh Parameter 을 선택하고, Boundary 탭을 선택한 후 , 5번 경계를 선택.
2. Maximum element size 항목에 1.5e-6을 선택하고, Remush 를 클릭.

1. Transport and Adsorption



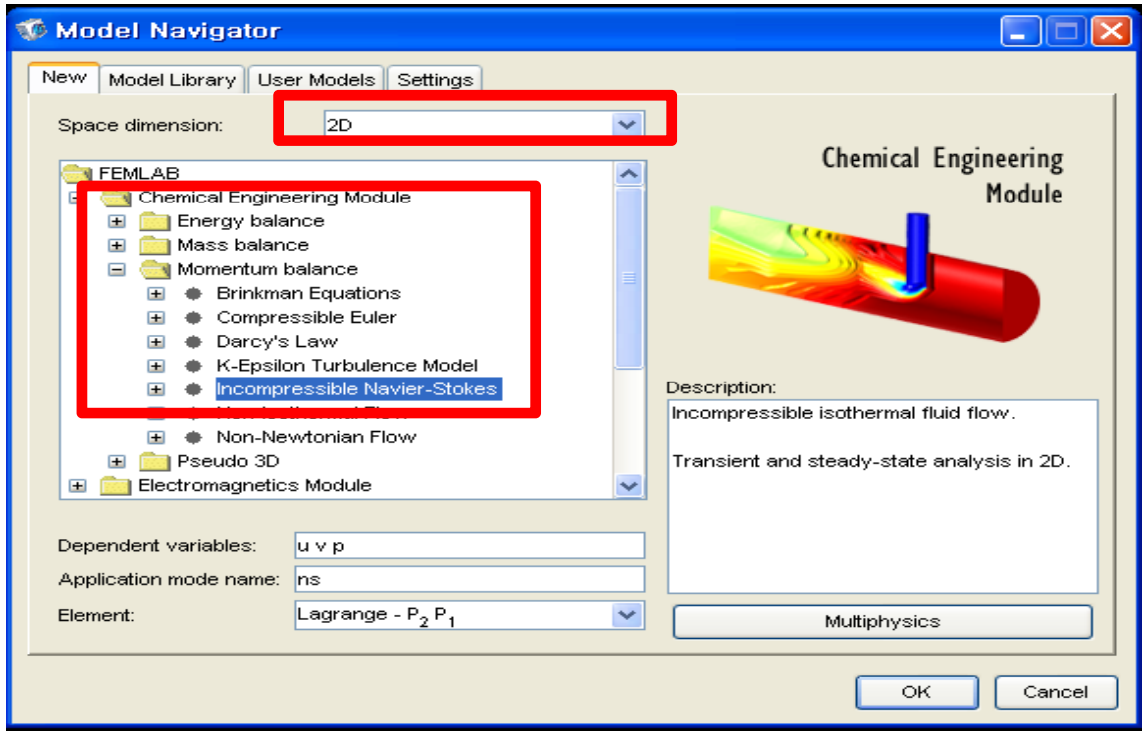
1. Postprocessing > Domain Plot Parameters 을 선택.
2. Line/Extrusion 탭을 선택하고, y-axis data 에 있는 Predefined quantities 에서 Convection and Diffusion > Concentration, c 를 선택.

1. Transport and Adsorption



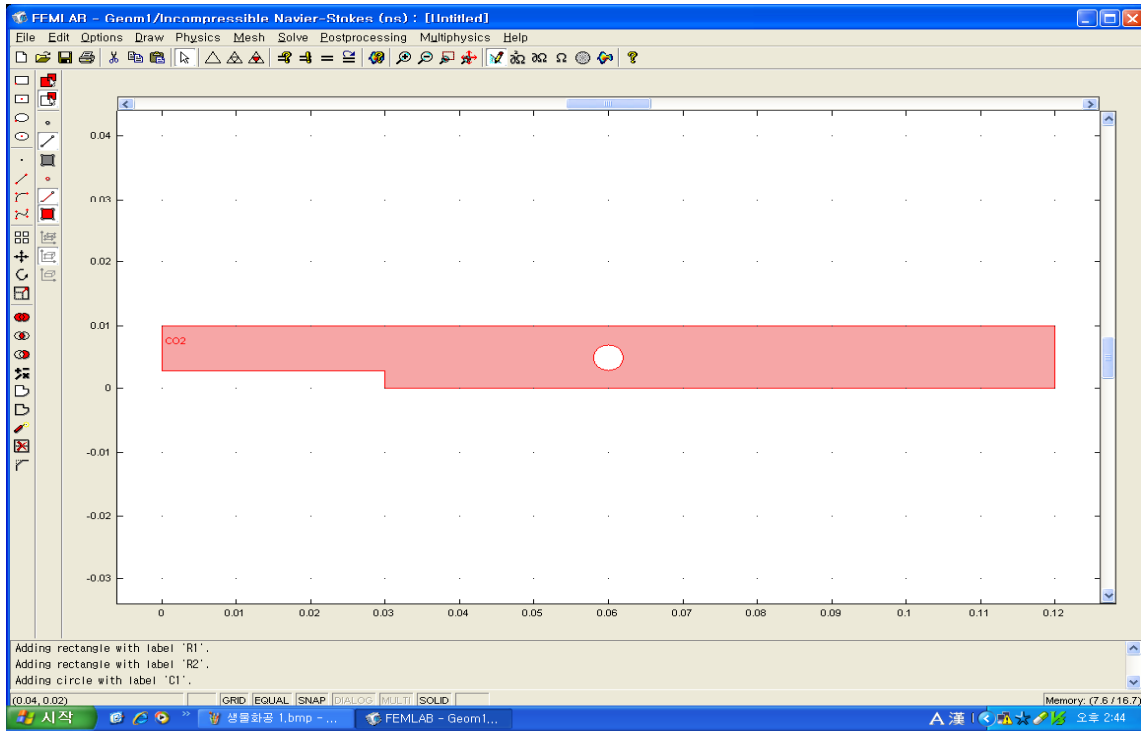
1. Boundary selection 에서 5번 경계를 선택, x-axis data 에서 y를 선택하고 Apply 클릭.
2. 5번 경계 길이에 대한 농도 분포 그래프를 확인 할수 있다.

2. Thermal decomposition in a parallel plate reactor.



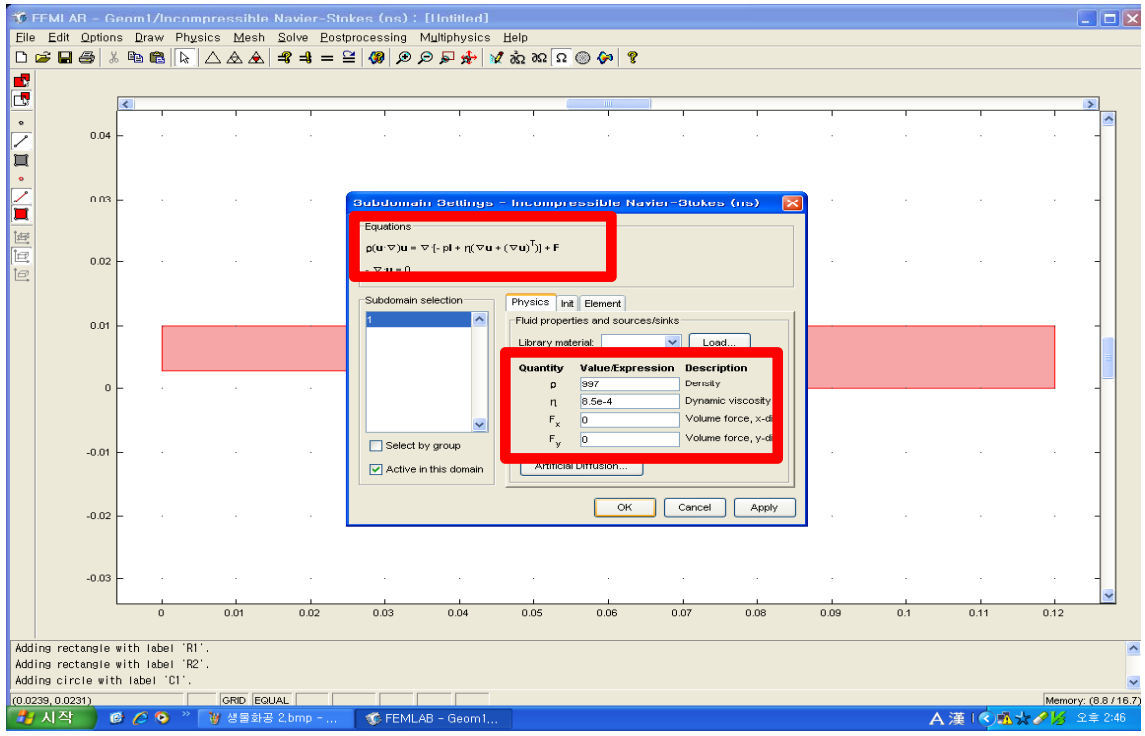
1. Chemical Engineering Module > Momentum Transport >Laminal Flow > Incompressible Navier – Stokes를 선택.
2. <Shift>+Rectangle/Square를 클릭, 너비와 높이 값을 입력 후 OK클릭.
3. <Shift>+Ellipse/Circle (Centered)를 클릭, Radius, x와 y값을 입력 후 OK클릭.

2. Thermal decomposition in a parallel plate reactor.



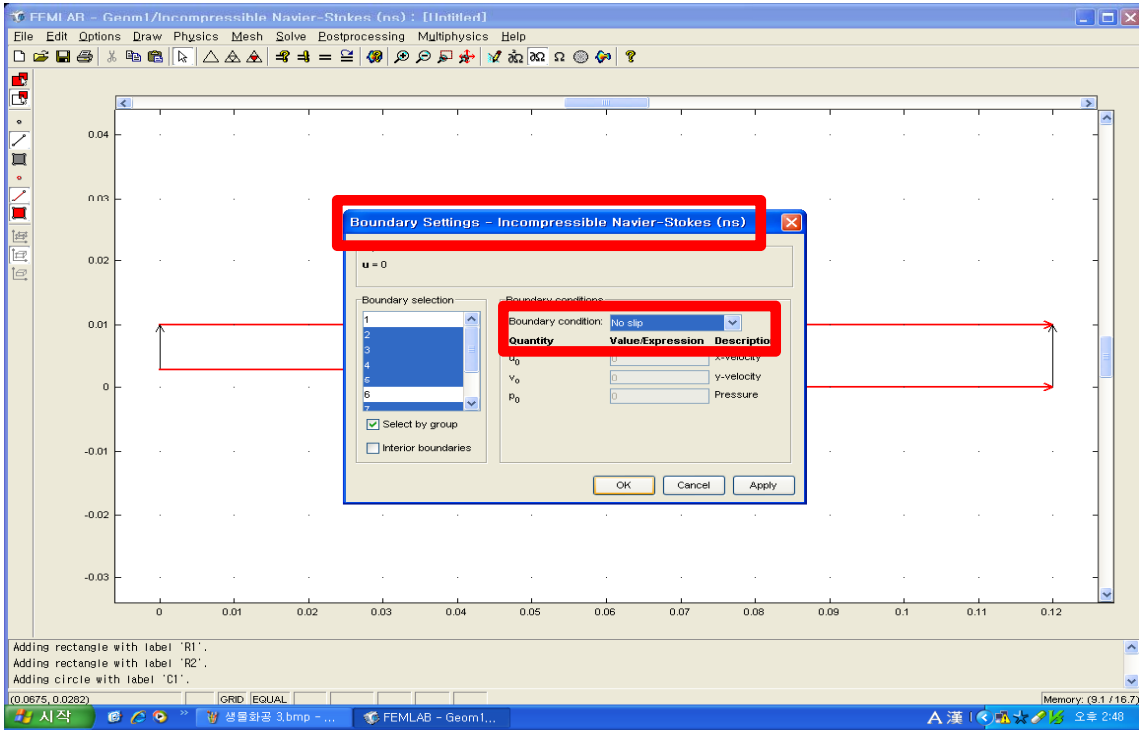
1. <Ctrl>+<A>를 클릭, 전체 구조체 선택, Difference 아이콘 클릭,
2. Zoom Extents를 클릭하면 다음 그림을 확인 할 수 있다.

2. Thermal decomposition in a parallel plate reactor.



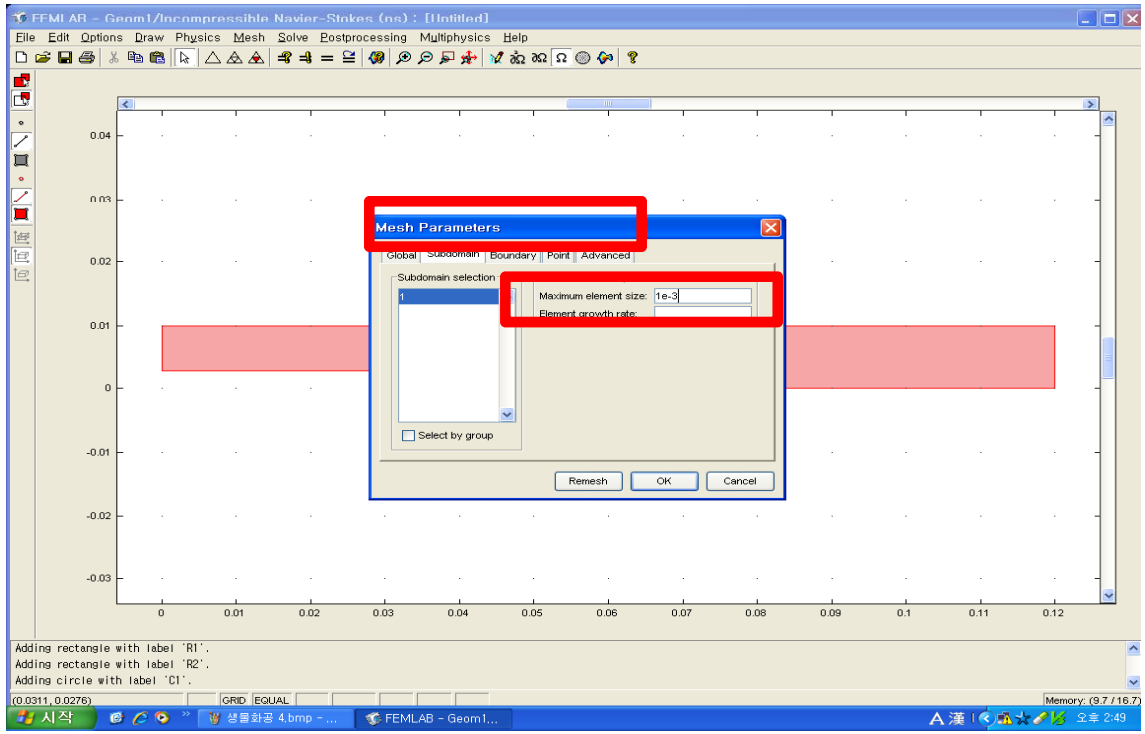
1. Subdomain Selection에서 1을 선택하고, 밀도와 점도를 입력 후 OK 클릭.

2. Thermal decomposition in a parallel plate reactor.



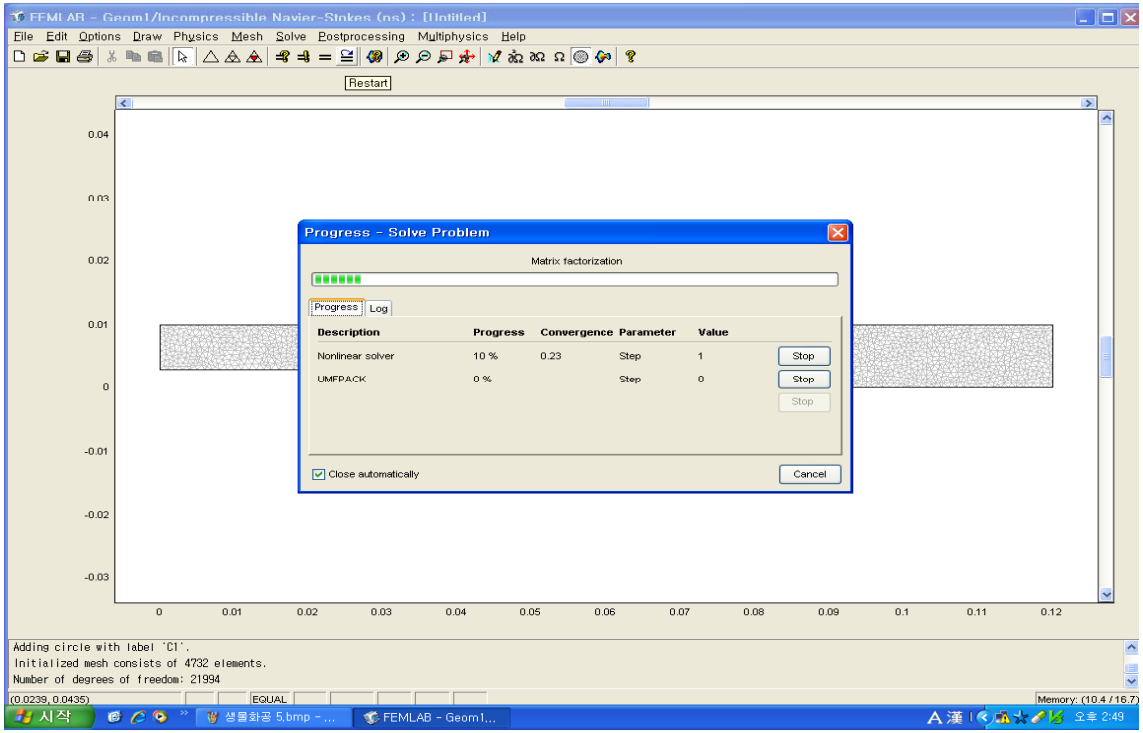
1. Physics > Boundary Setting을 클릭, 값을 입력 후 OK 클릭.

2. Thermal decomposition in a parallel plate reactor.



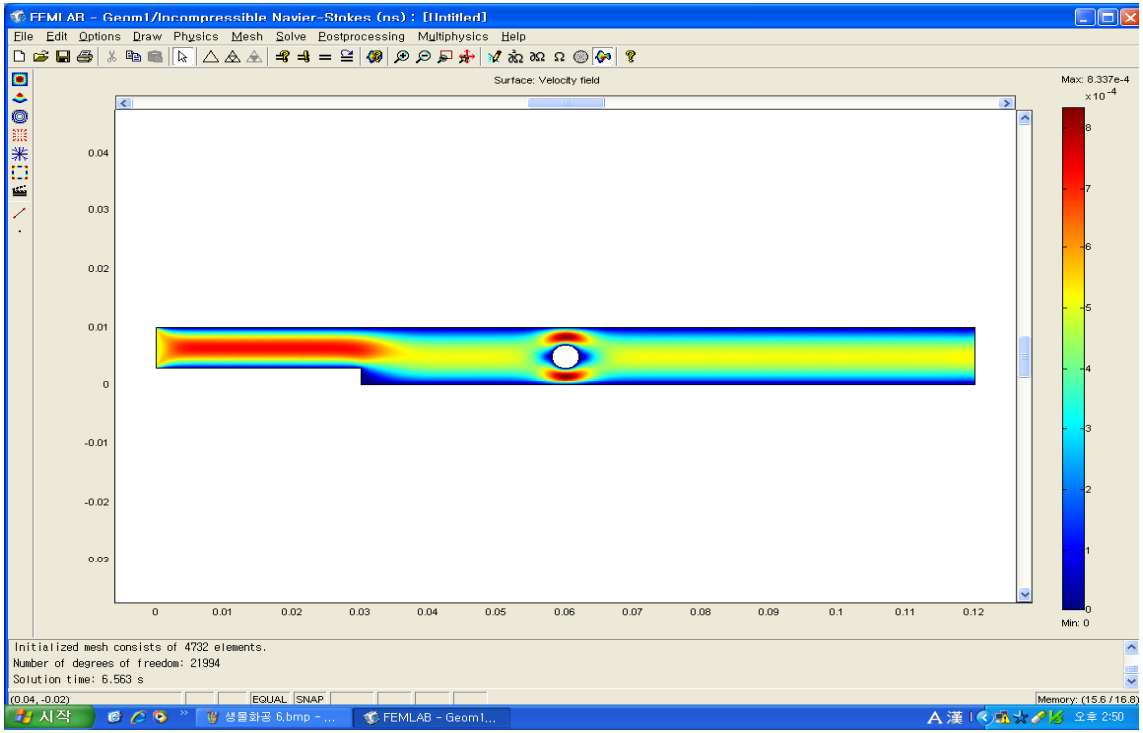
1. Mesh > Free Mesh Parameter 을 선택, Maximum element sizedp 1e-1을 입력 후 OK 클릭,

2. Thermal decomposition in a parallel plate reactor.



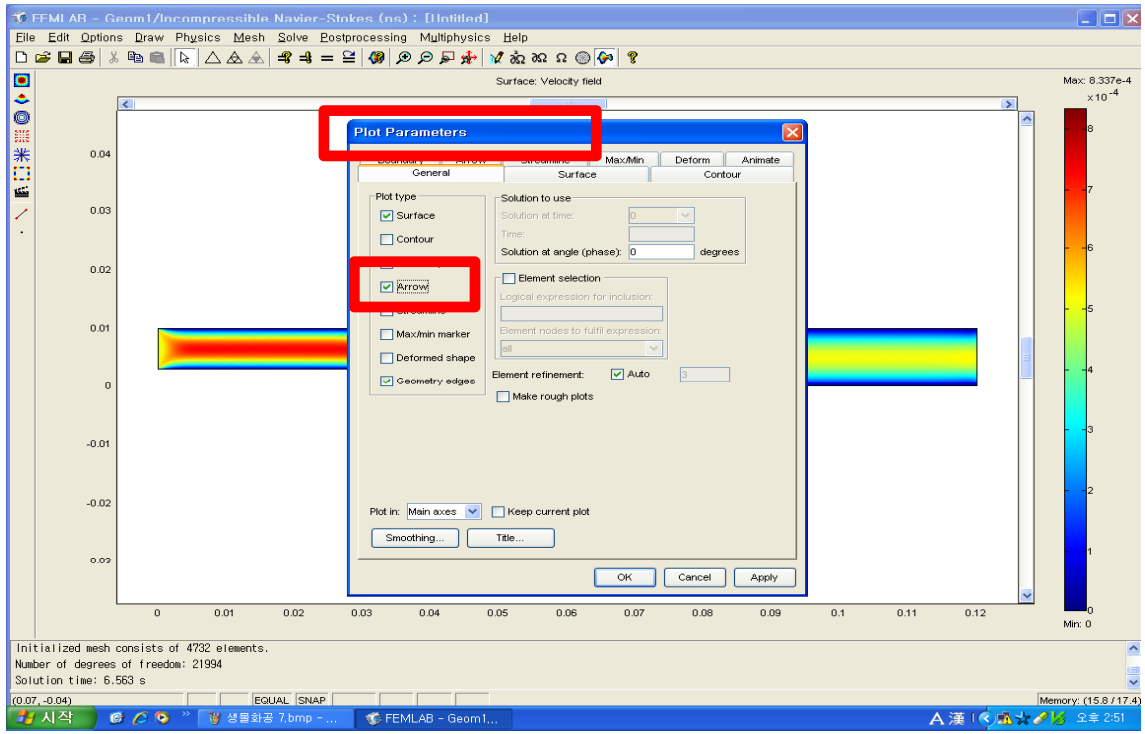
1. Initialize Mesh 클릭한 후, Solve 클릭

2. Thermal decomposition in a parallel plate reactor.



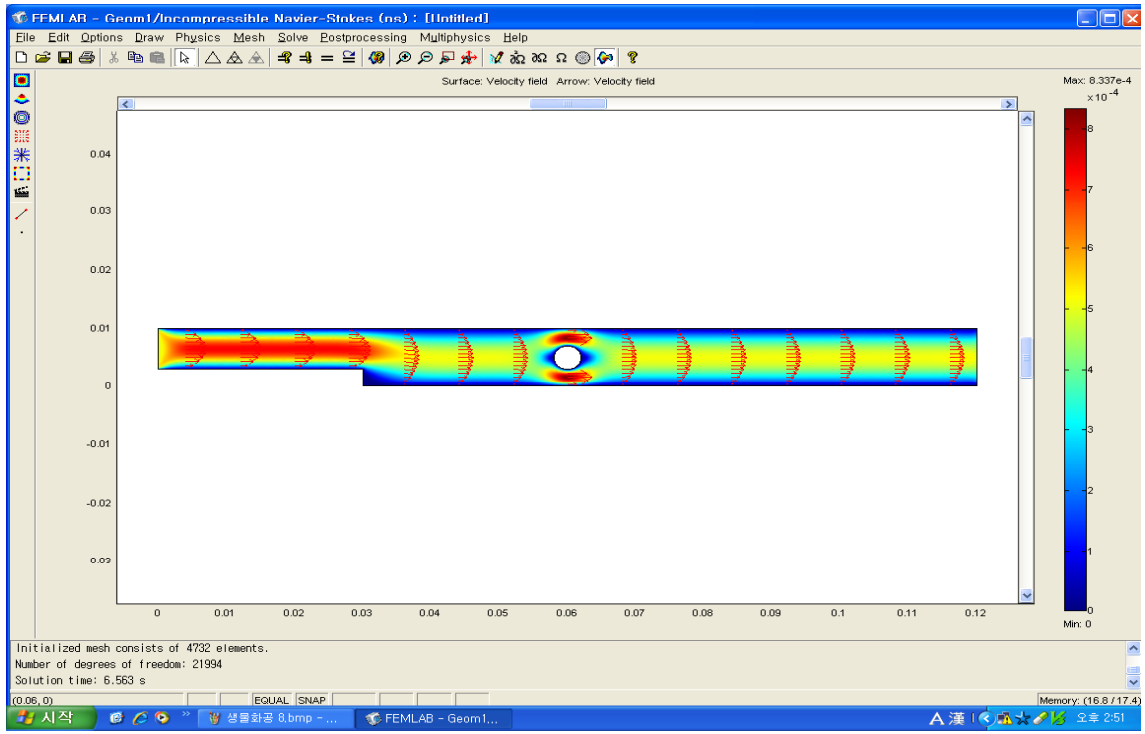
1. 유속분포 그래프를 확인 할 수 있다.

2. Thermal decomposition in a parallel plate reactor.



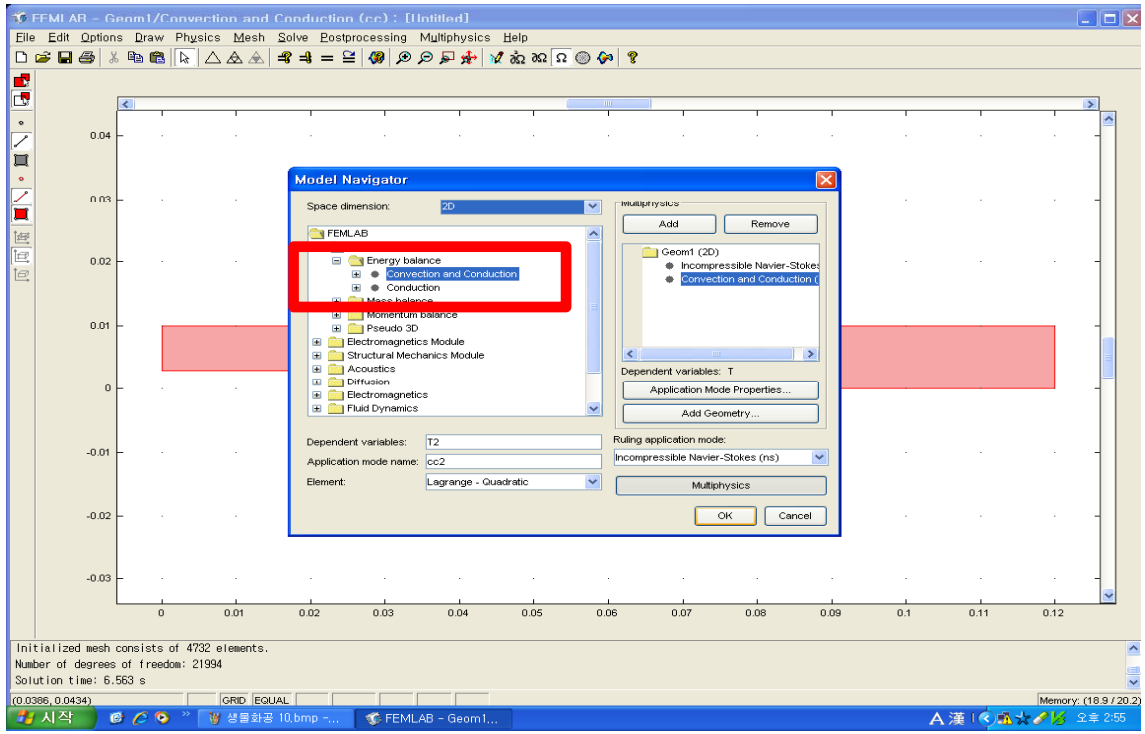
1. Plot parameter를 클릭, Plot type의 Arrow를 활성화시킨 후 OK 클릭.

2. Thermal decomposition in a parallel plate reactor.



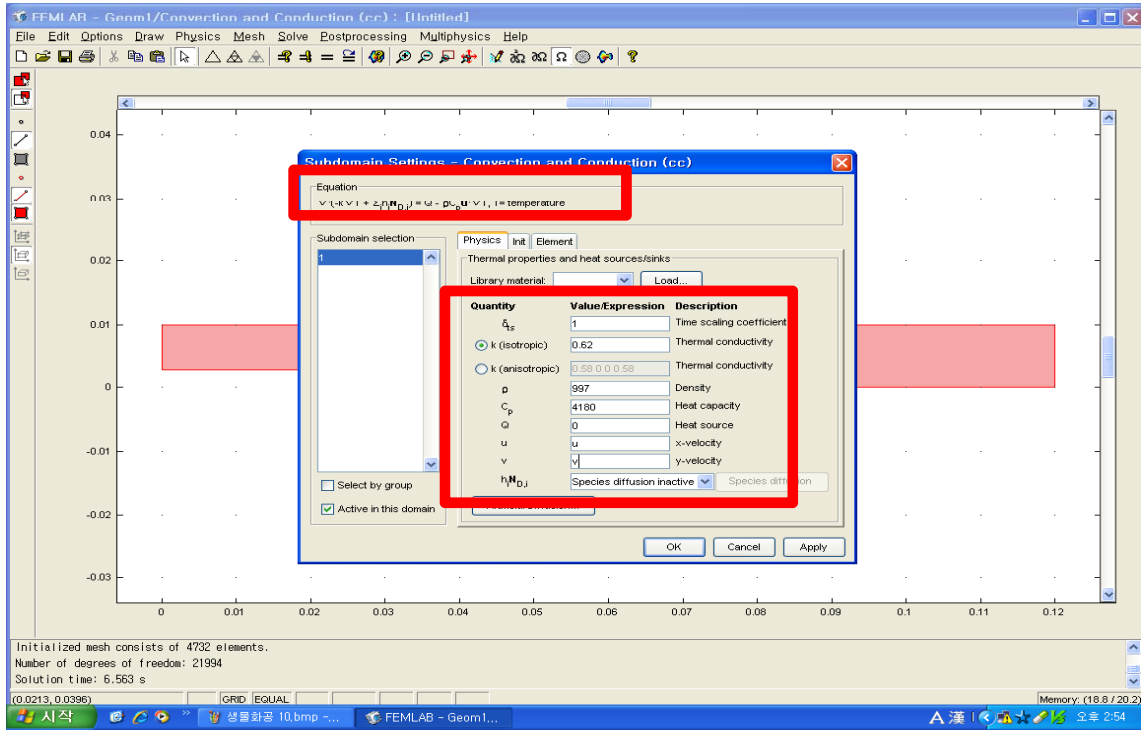
1. 화살표로 표시된 유속분포 그래프를 확인 할 수 있다.

2. Thermal decomposition in a parallel plate reactor.



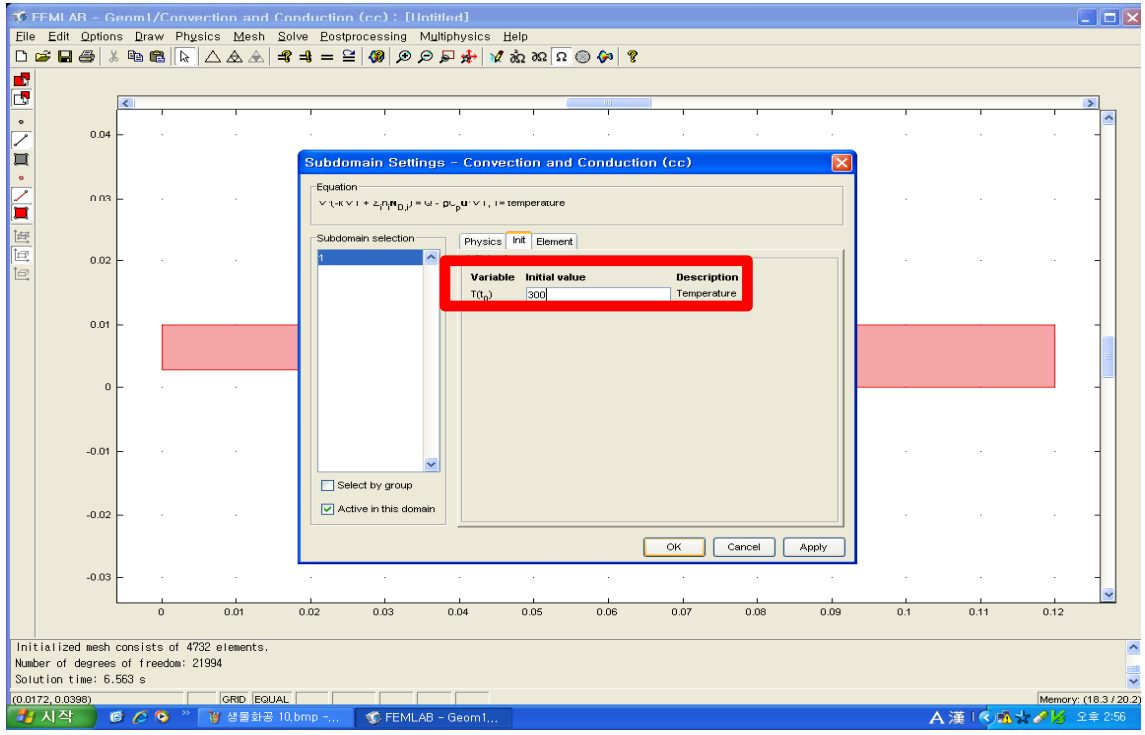
1. Chemical Engineering Module > Energy transport > Convection and conduction 을 선택, Add 클릭 후 ,OK 클릭.

2. Thermal decomposition in a parallel plate reactor.



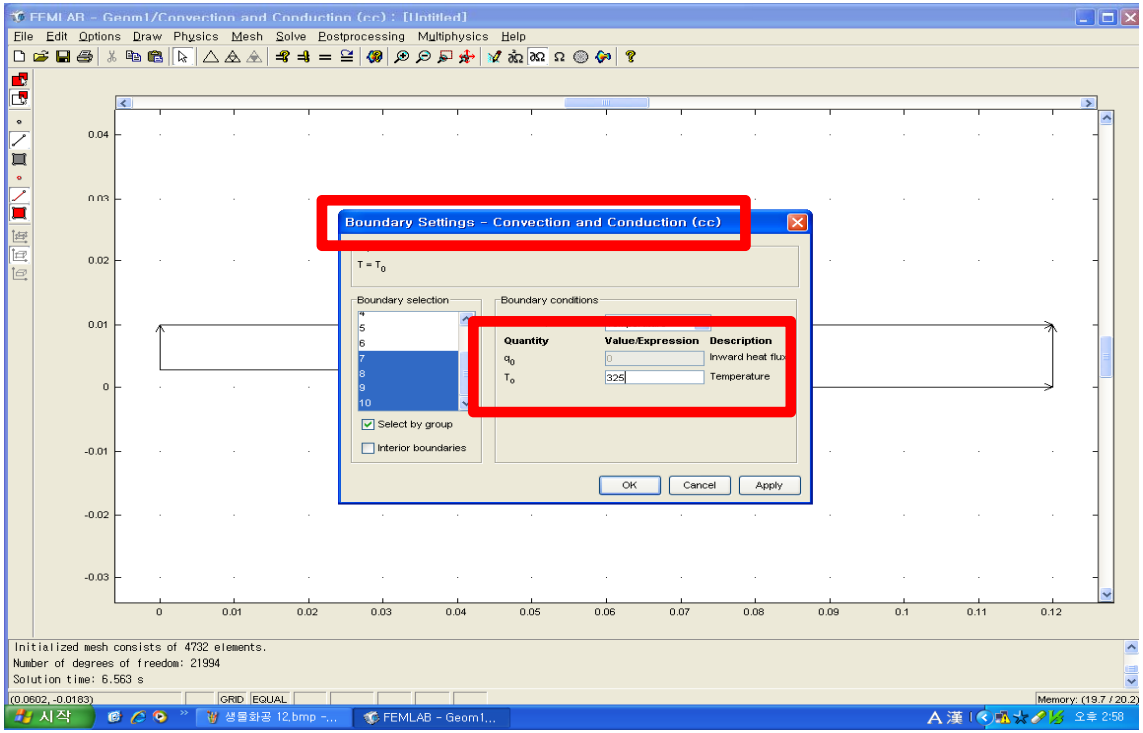
1. Physics > Subdomain Settings 선택, 값을 입력.
   여기서 u, v 는 Navier-stokes 의 종속 변수.

2. Thermal decomposition in a parallel plate reactor.



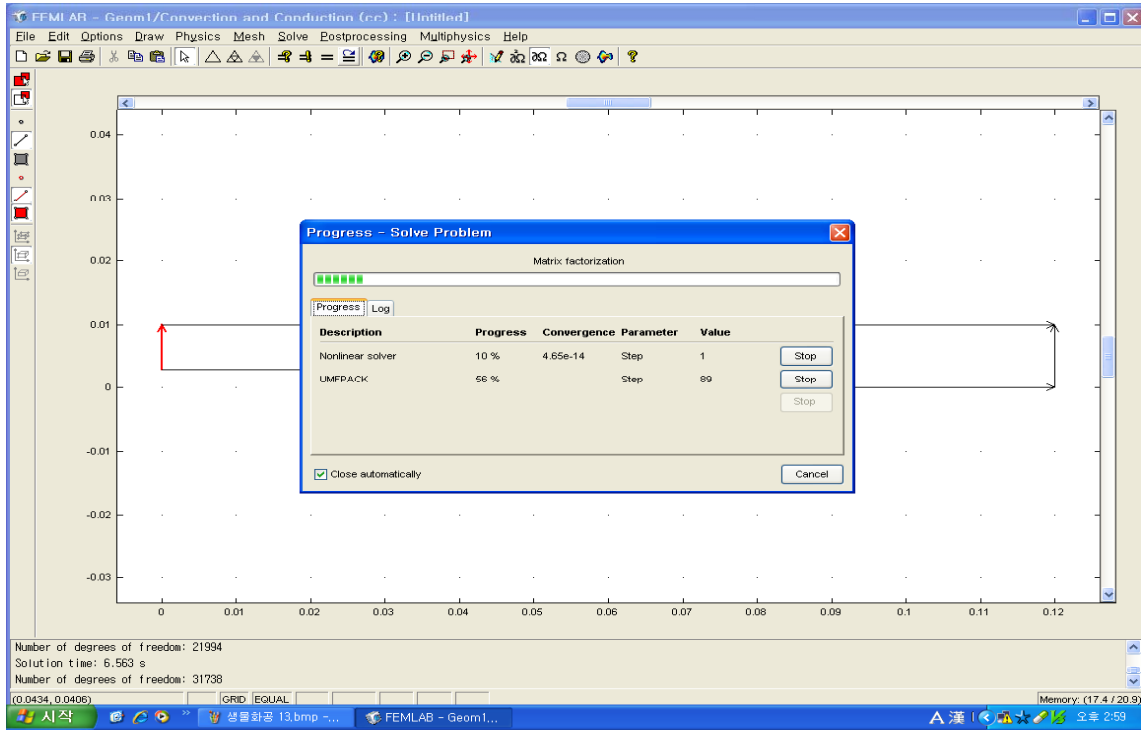
1. Init탭에서 T(t0)에 300 입력, OK클릭.

2. Thermal decomposition in a parallel plate reactor.



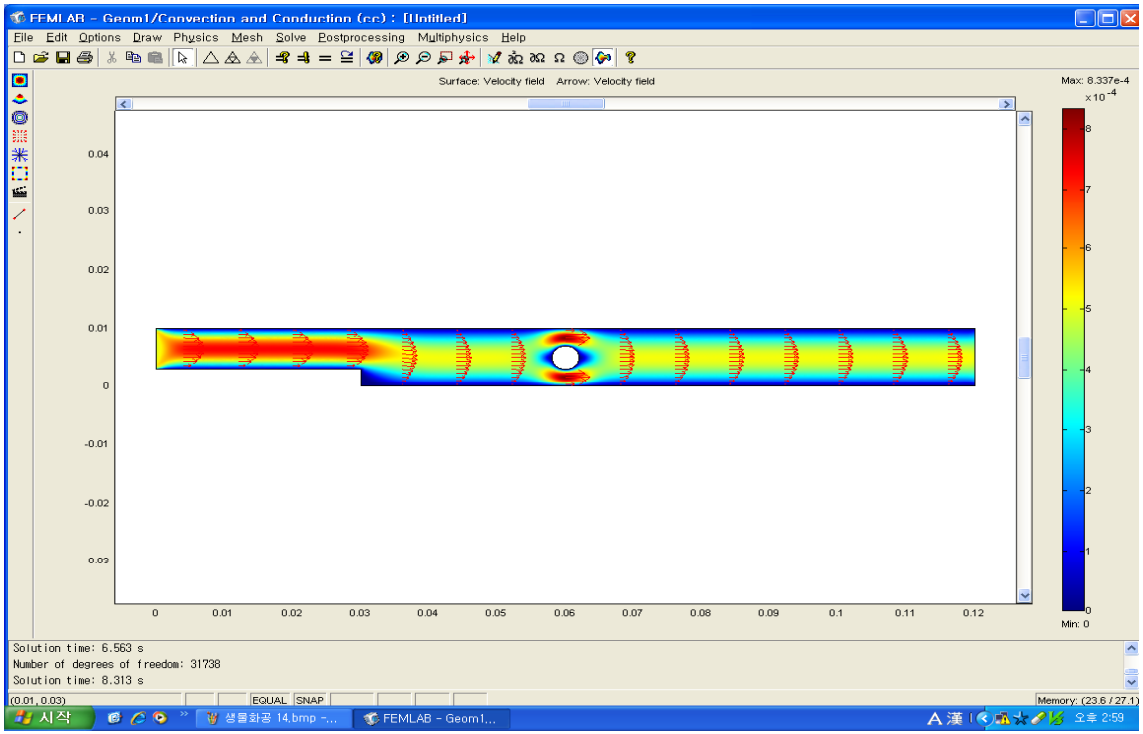
1. Physics > boundary Settings 선택, 값을 입력, OK클릭

2. Thermal decomposition in a parallel plate reactor.



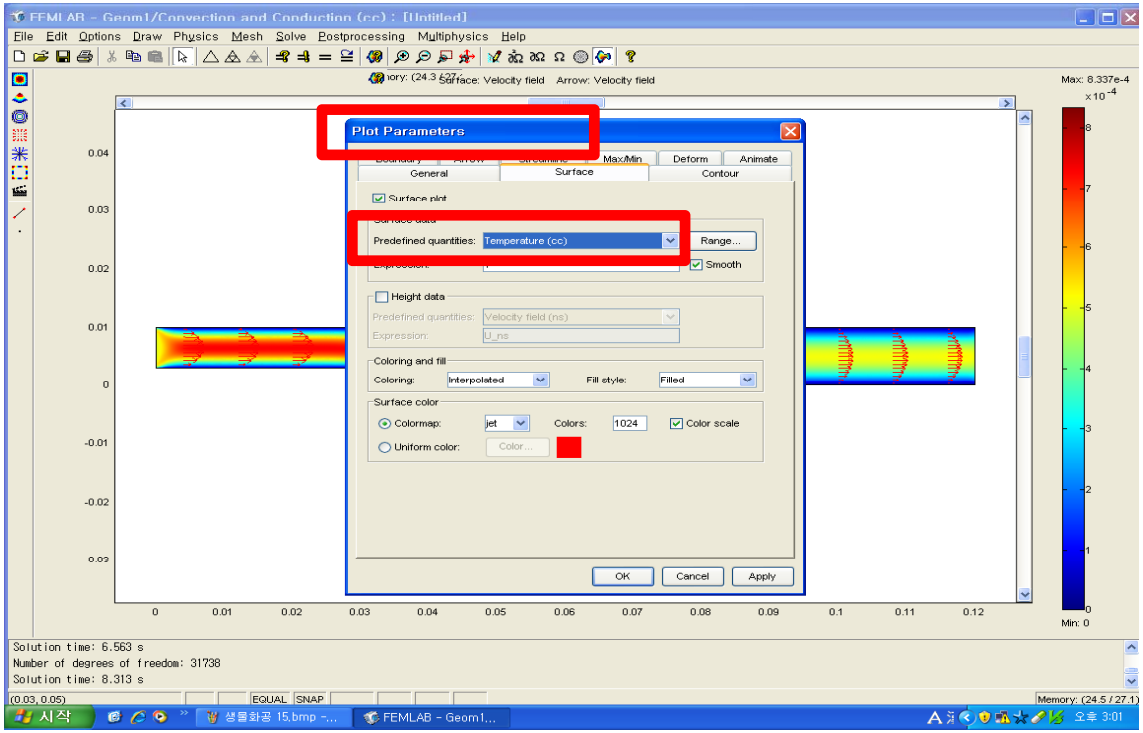
1. Restart 클릭. 앞서 계산한 유체를 초기값으로 계산하여 유체와 열을 동시에 풉니다.

2. Thermal decomposition in a parallel plate reactor.



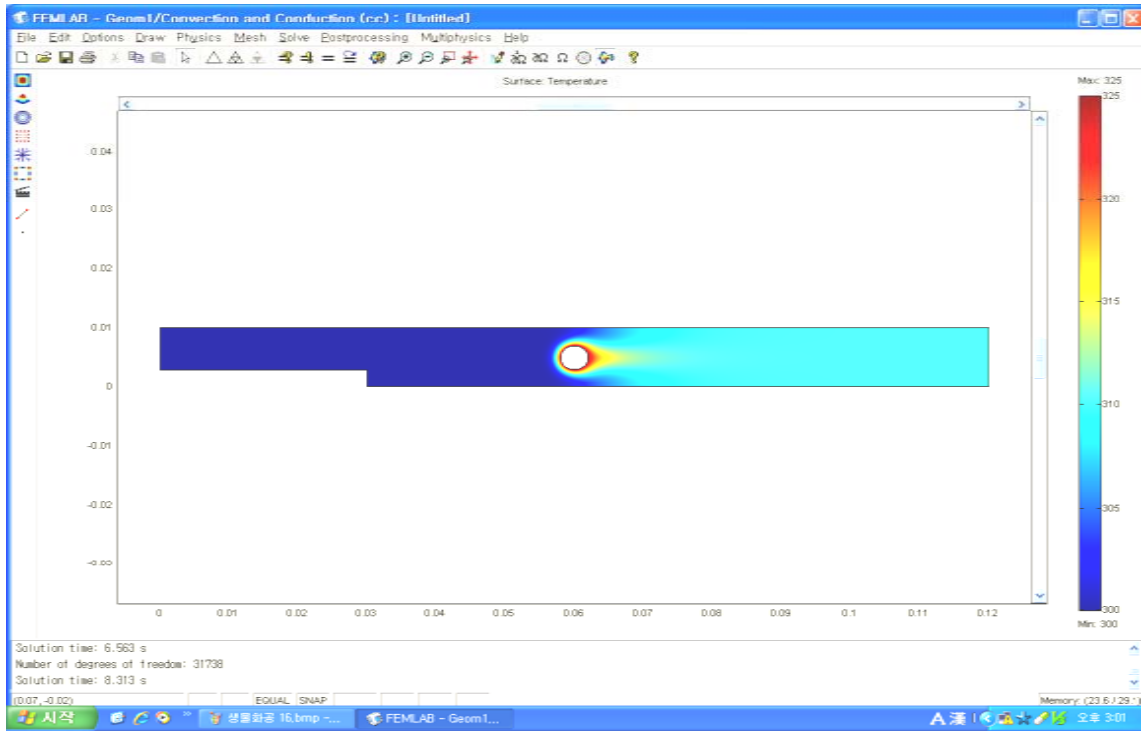
1. 초기값으로 설정된 유체에 대한 온도 분포 그래프를 확인 할 수 있다.

2. Thermal decomposition in a parallel plate reactor.



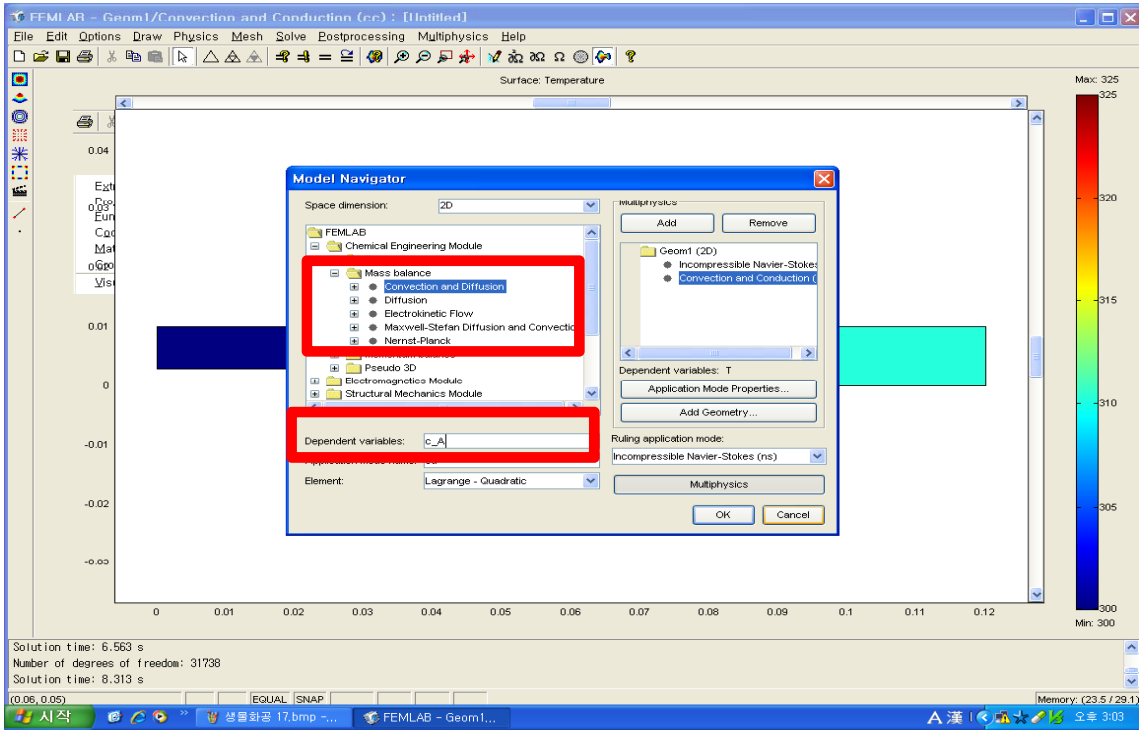
1. Plot Parameters를 클릭하고, 앞에서 설정한 Arrow를 비활성 한 후, Predefined quantities에 있는 Convection and Conduction (chcc) > Temperature 선택.

2. Thermal decomposition in a parallel plate reactor.



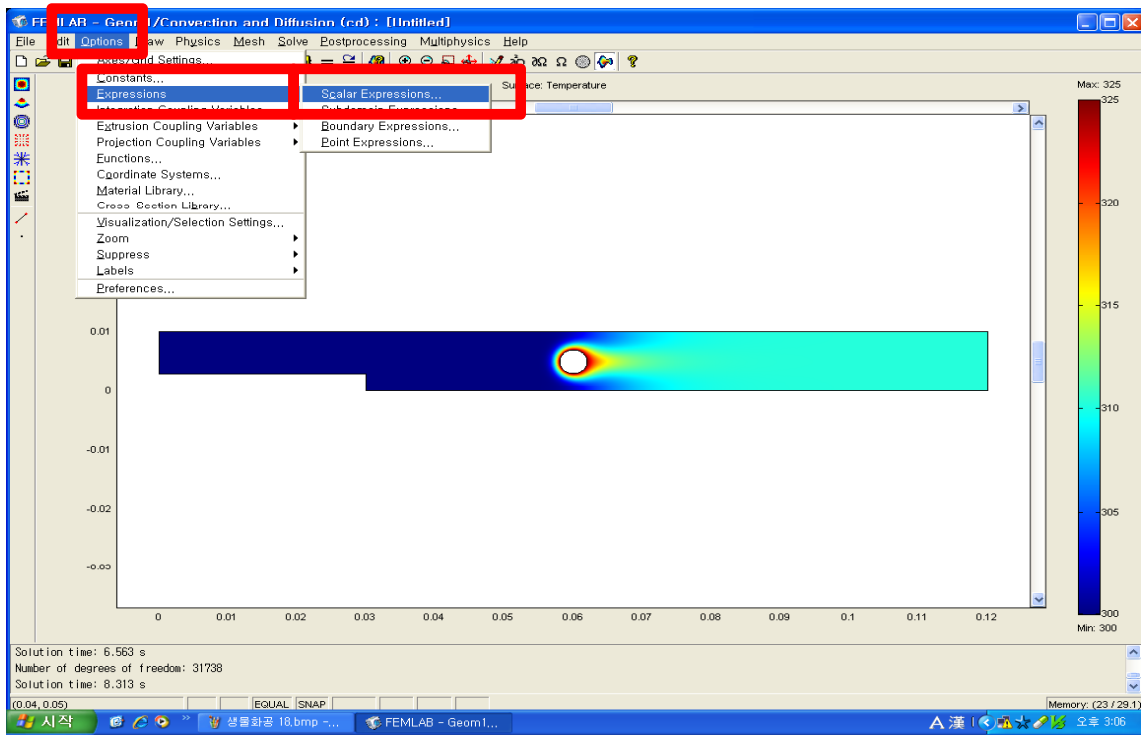
1. 온도분포 그래프를 확인 할 수 있다.

2. Thermal decomposition in a parallel plate reactor.



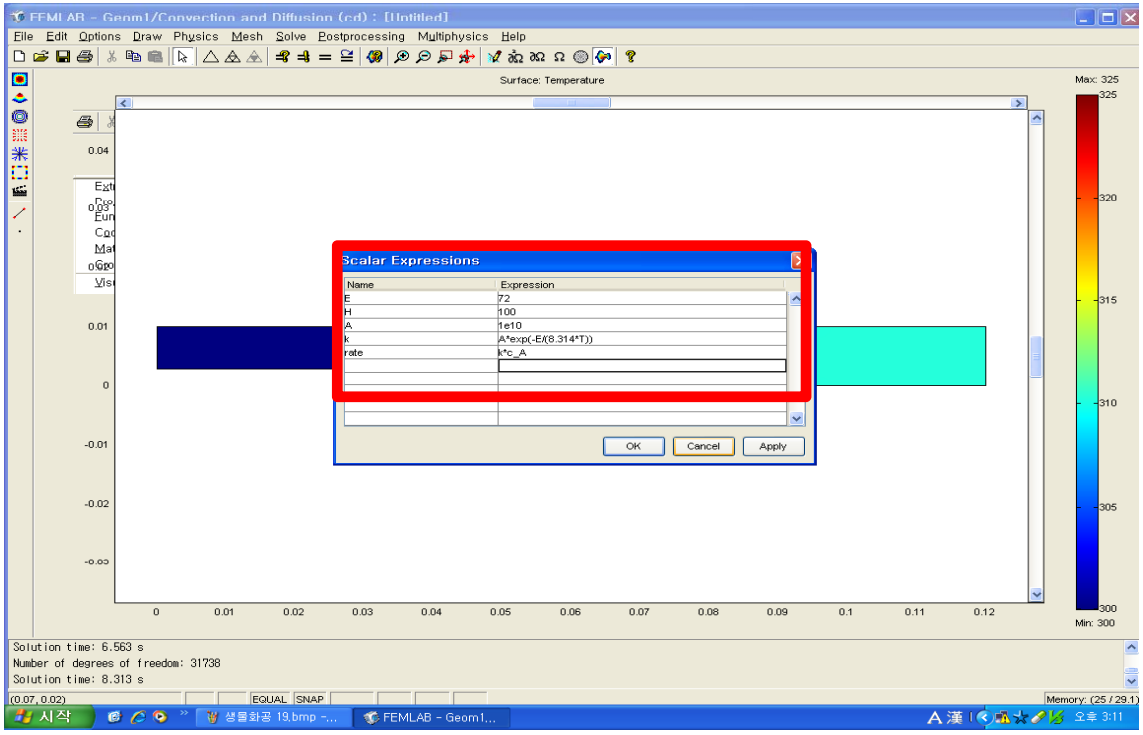
1. Multiphysics > Model navigator 을 선택.
2. Chemical Engineering Module > Mass Transport > Convection and Diffusion 을 선택.
3. Dependent variables에서 c_A 입력, Add 클릭, OK클릭.

2. Thermal decomposition in a parallel plate reactor.



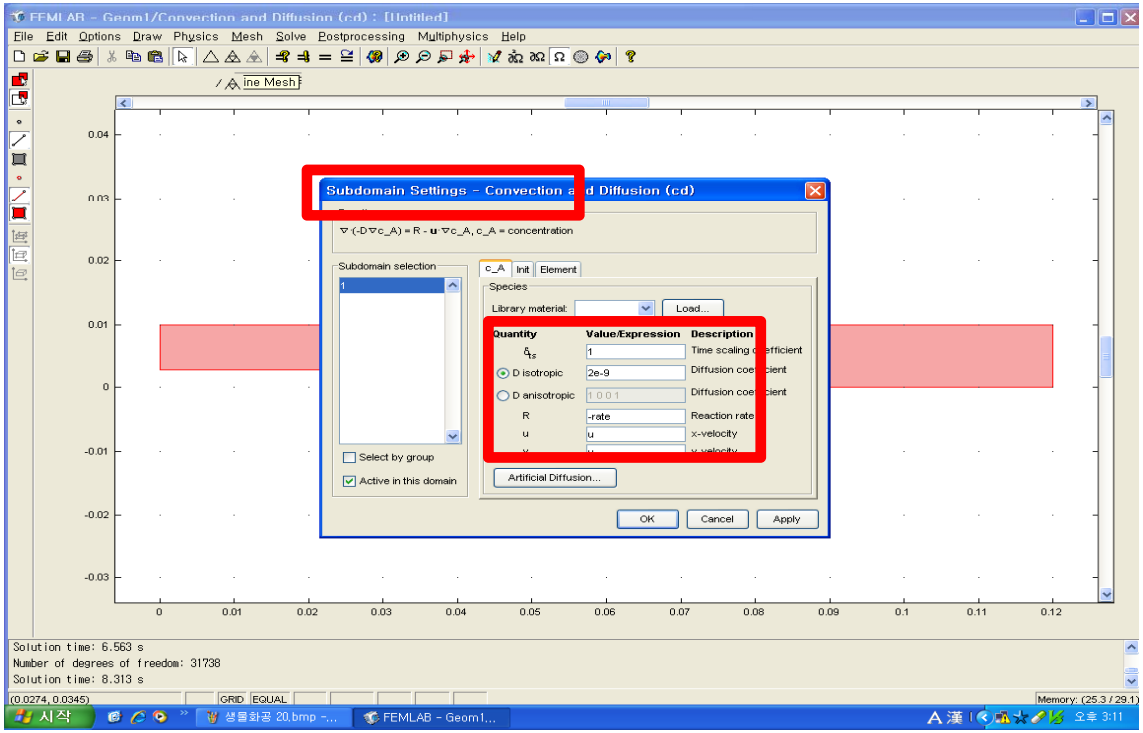
1. Option > Expressions > Scalar Expressions 선택.

2. Thermal decomposition in a parallel plate reactor.



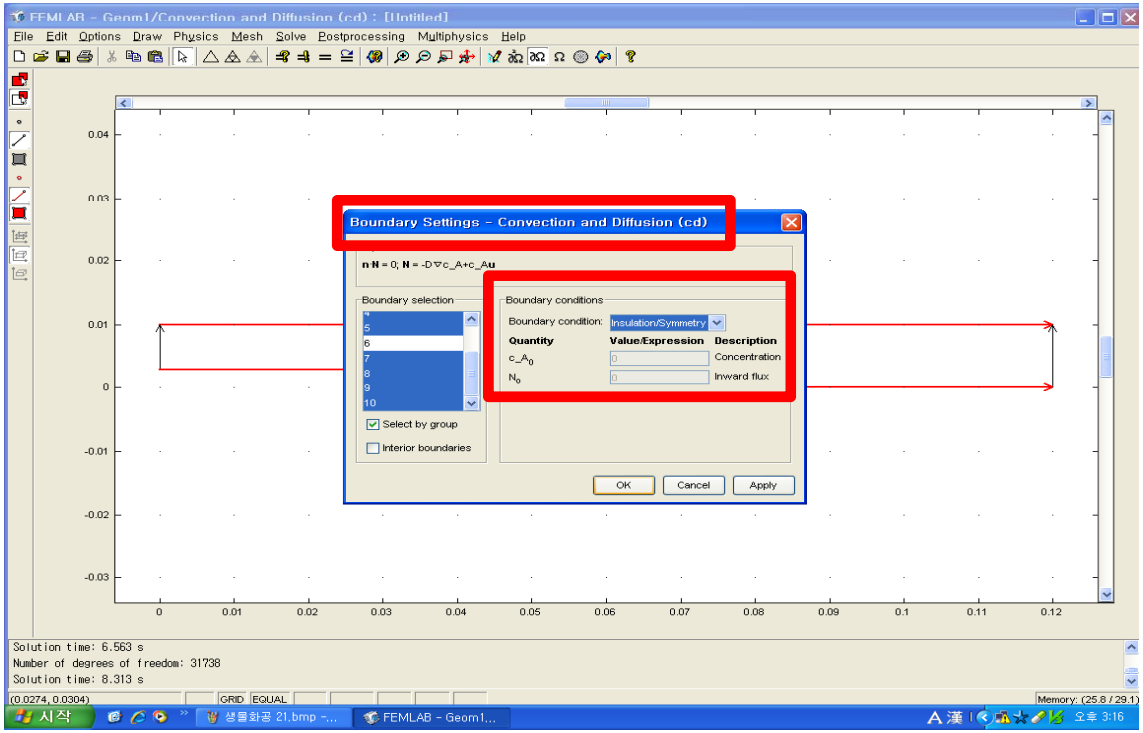
1. Scalar Expressions 선택한 후, 활성화 에너지, 반응열, 반응속도 상수 등의 값을 입력, OK클릭

2. Thermal decomposition in a parallel plate reactor.



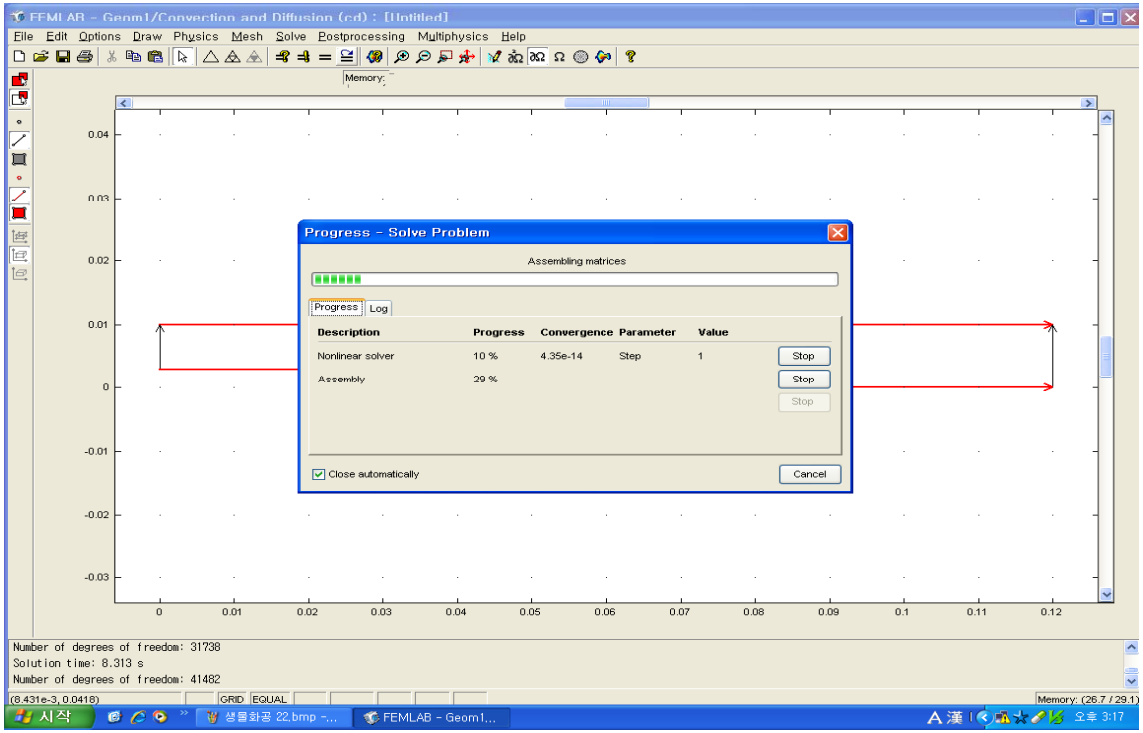
1. Physics > Subdomain Settings 선택, 값을 입력.

2. Thermal decomposition in a parallel plate reactor.



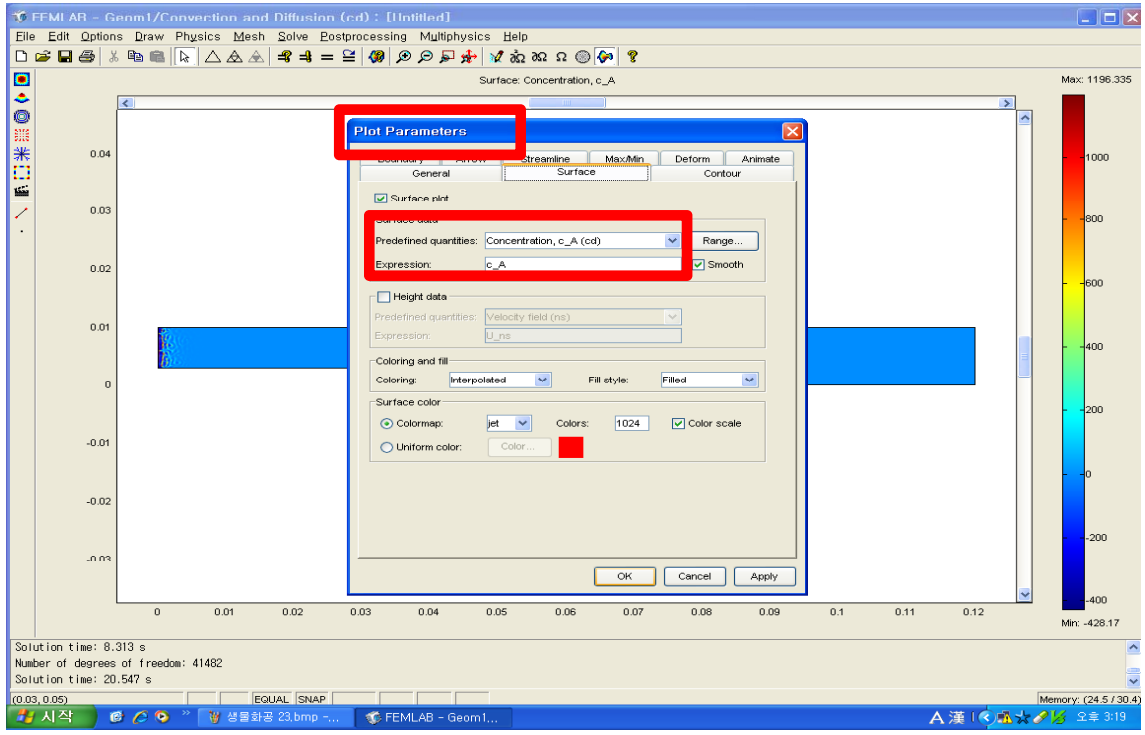
1. Physics > boundary Settings 선택, 경계조건, c_A0등 값을 입력.

2. Thermal decomposition in a parallel plate reactor.



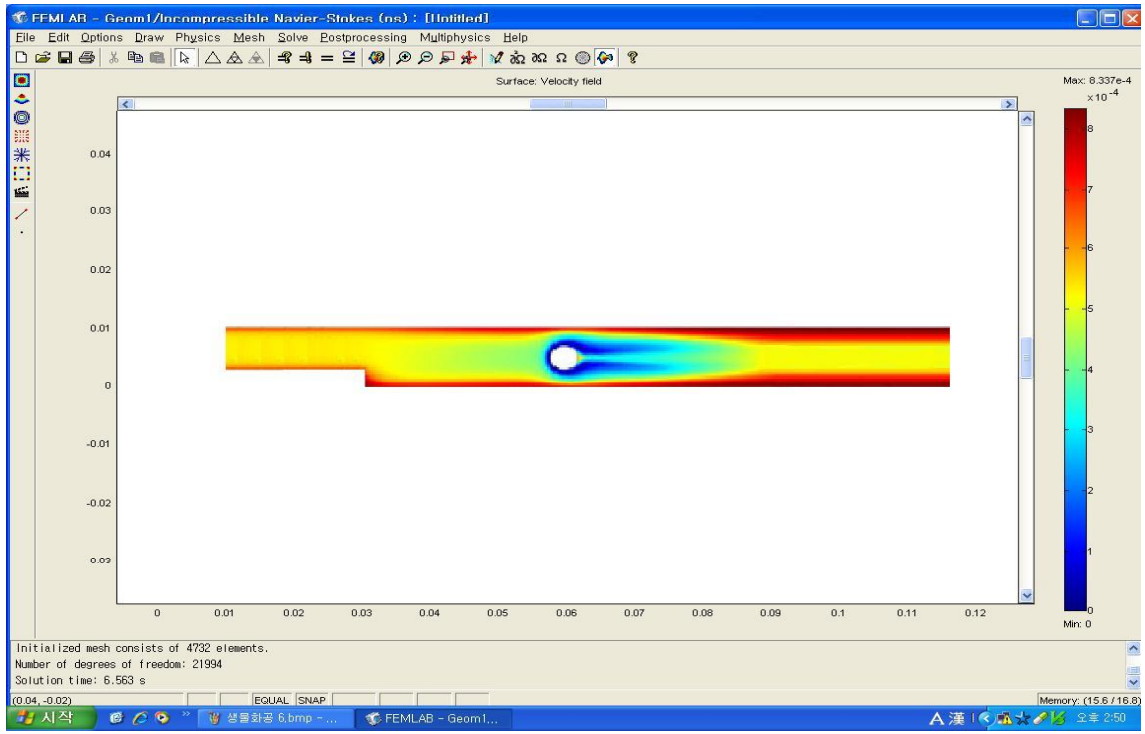
1. Restart 클릭.

2. Thermal decomposition in a parallel plate reactor.



1. Plot Parameters를 클릭하고, Convection and Conduction (chcc) > Concentration, c_A0선택, OK클릭.

2. Thermal decomposition in a parallel plate reactor.



1. Plot Parameters를 클릭하고, 앞에서 설정한 Arrow를 비활성 한 후, Predefined quantities에 있는 Convection and Conduction (chcc) > Temperature 선택.