Independent variables, yi

|  |  |  |  |
| --- | --- | --- | --- |
| i |  |  | y(i) |
| 1 |  | Mass fraction of component A (solute) in lumen side | y(1) |
| 2 |  | Mass fraction of component A (solute) in shell side | y(2) |
| 3 |  | Mass fraction of component B (solute) in lumen side | y(3) |
| 4 |  | Mass fraction of component B (solute) in shell side | y(4) |
| 5 |  | Mass-averaged velocity of lumen-side stream | y(5) |
| 6 |  | Mass-averaged velocity of shell-side stream | y(6) |
|  |  |  |  |
|  |  | Averaged concentration of mass-to-volume in lumen side | MassConc(1) |
|  |  | Averaged concentration of mass-to-volume in shell side | MassConc(2) |
|  |  | Transmembrane mass flux of component A from the shell side to lumen side | MassFlux(A) |
|  |  | Transmembrane mass flux of component B from the lumen side to shell side | MassFlux(B) |
|  |  |  |  |

fi(yi, t)

|  |  |  |  |
| --- | --- | --- | --- |
| i | lhs | rhs | Pseudo code |
| 1 |  |  | Circum(1)/CSA(1) \* (y(1)\*MassFlux(B)+y(3)\*MassFlux(A)) / (MassConc(1)\*y(5)) |
| 2 |  |  | - Circum(2)/CSA(2) \* (y(4)\*MassFlux(A)+y(2)\*MassFlux(B)) / (MassConc(2)\*y(6)) |
| 3 |  |  | - Circum(1)/CSA(1) \* (y(1)\*MassFlux(B)+y(3)\*MassFlux(A)) / (MassConc(1)\*y(5)) |
| 4 |  |  | Circum(2)/CSA(2) \* (y(4)\*MassFlux(A)+y(2)\*MassFlux(B)) / (MassConc(2)\*y(6)) |
| 5 |  |  | Circum(1)/CSA(1) \* (MassFlux(B)-MassFlux(A))/MassConc(1) - y(5)/MassConc(1)\*(Density(A)\*rhs(1)+Density(B)\*rhs(3)) |
| 6 |  |  | Circum(2)/CSA(2) \* (MassFlux(B)-MassFlux(A))/MassConc(2) - y(6)/MassConc(2)\*(Density(A)\*rhs(2)+Density(B)\*rhs(4)) |
|  |  |  |  |

I.C.

|  |  |  |  |
| --- | --- | --- | --- |
| i |  | y(i), where z = 0 |  |
| 1 |  | y(1) = InitMassFrac(A,1) |  |
| 2 |  | y(2) = InitMassFrac(A,2) |  |
| 3 |  | y(3) = InitMassFrac(B,1) |  |
| 4 |  | y(4) = InitMassFrac(B,2) |  |
| 5 |  | y(5) = InitVelocity(1) |  |
| 6 |  | y(6) = InitVelocity(2) |  |
|  |  |  |  |

Jacobi matrix 