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## Exercise 10: Protein concentration in a flow chamber

- Blanc Model
- Add Component/2D
- Geometry/Length unit:  $\mu\text{m}$
- Geometry/Add Rectangle: Width = 1200 [ $\mu\text{m}$ ], Height = 250 [ $\mu\text{m}$ ]
- Geometry/Add Point: x = 400 [ $\mu\text{m}$ ], y = 0 [ $\mu\text{m}$ ]
- Geometry/Add Point: x = 600 [ $\mu\text{m}$ ], y = 0 [ $\mu\text{m}$ ]
- Material/Add Material from Library/ Built-in/Water, liquid
- Global parameters/Parameters 1/Load from file/File: exerciseParameters.txt
- Definitions/Variables/Geometric entity: Boundary, Selection: cell layer (edge 4),  $\text{react\_surf} = \text{kon} * (\text{Rt} - \text{cs1}) * \text{c} - \text{koff} * \text{cs1}$
- Add Physics/Fluid/Flow/Single-Phase Flow/Laminar Flow (spf)
- Laminar Flow/Inlet/Fully developed flow/Boundary: left side (edge 1), Flow rate:  $\text{vin}$
- Laminar Flow/Outlet/ Fully developed flow/Boundary: right side (edge 6), Average pressure:  $\text{Pav} = 0$
- Add physics/Chemical Species Transport/Transport of Diluted Species (tds)
- Transport of Diluted Species/Transport properties/Velocity field/u: Velocity field (spf), Diffusion Material: Water, Diffusion coefficient: D
- Transport of Diluted Species/Initial Values/Concentration:  $\text{c} = \text{c0}$
- Transport of Diluted Species/Flux/General inward flux/ (Species c):  $-\text{react\_surf} + \text{paracrine}$ , Selection: cell layer (segment 4)
- Transport of Diluted Species/Reactions/Domain: all (surface 1), Reaction rates:  $\text{Rc} = -\text{c}/\text{tau}$
- Transport of Diluted Species/Outflow/Boundary selection: outlet (segment 6)
- Add Physics/Chemical Species Transport/Surface Reactions (sr)
- Surface Reactions/Domain: cell layer (segment 4)
- Surface Reactions/Surface Properties: Density of sites:  $\text{Ts} = \text{Rt}$ , Site occupancy number = 1, Surface diffusion = D
- Surface Reactions/Initial Values/Surface concentration:  $\text{cs1} = \text{cs0}$
- Surface Reactions/Reaction Rate for surface species:  $\text{Rs}, \text{cs} = \text{react\_surf}$
- Mesh/Physics-controlled mesh/Element size: Extra fine
- Add study/Empty Study
- Study 1/Parametric Sweep/Parameter name:  $\text{vin}$  (inflow rate), Parameter value list: 0 3 [ml/min]
- Study 1/Study step/Stationary/Stationary/Laminar Flow (spf)
- Study 1/Study step/Stationary/Stationary/Surface Reaction (sr), Transport of Diluted Species (tds)
- Add Study/Stationary/Laminar flow
- Add study/Stationary/Surface Reaction and Transport of diluted species
- Results/2D/Surface/Expression: c
- Results/Concentration (c)/Line graph/Selection: cell layer (Edge 4), Expression: c, x-Axis expression: x
- Results/Concentration (c)/Parameters section ( $\text{vin}$ ): All