A mathematical modeling toolbox for ion channels and transporters across cell membranes

Shadi Zaheri[a], Fatemeh Hassanipour[a,*]

[a]*Department of Mechanical Engineering, The University of Texas at Dallas, Richardson, TX, 75080, USA*

The following supplementary material is from " A mathematical modeling toolbox for ion channels and transporters across cell membranes" manuscript. It contains an overview of all equations related to Ion channels, Pumps, Cotransporters, and Symporters, organized in a table form. The detailed transporters along with the descriptions of their equatuons can be found from here.

⋆This document is the result of the research project funded by the National Science Foundation.

*Corresponding author

Email addresses: shadi.zaheri@utdallas.edu (Shadi Zaheri), fatemeh@utdallas.edu (Fatemeh Hassanipour)

1.2.2. *Voltage Gated Sodium Channel (VGSC, Na_v, VONa)*

Voltage Gated Sodium Channel (*VGSC*, Na_v, *VONa*)	**Ref**
$$\boxed{I_{Na,Na_v} = g^{max}_{Na_v} m^3_{Na_v} \; h_{Na_v} \left(V_m - V^{M-N}_{Na,rev}\right)} \quad (33)$$	[2, 13]
$$\frac{dm_{Na_v}}{dt} = \frac{\bar{m}_{Na_v} - m_{Na_v}}{\tau_m} \quad (34)$$	
$$\frac{dh_{Na_v}}{dt} = \frac{\bar{h}_{Na_v} - h_{Na_v}}{\tau_h} \quad (35)$$	
$$\bar{m}_{Na_v} = \frac{1}{1 + exp\left(\frac{-(V^{M-N}_m + V^{M-N}_{1/2,m\,Na_v})}{k_{m\,Na_v}}\right)} \quad (36)$$	
$$\bar{h}_{Na_v} = \frac{1}{1 + exp\left(\frac{(V^{M-N}_m + V^{M-N}_{1/2,h\,Na_v})}{k_{h\,Na_v}}\right)} \quad (37)$$	

Table 3: The corresponding equations describing the ionic current transported via voltage gated sodium channels (*VGSC*s, Na_vs, *VONA*s) across the cell membrane (part 1/3 continued from previous page)