1 Flory and Gent model

Terzaghi Stress tensor is given by:

$$\boxed{\boldsymbol{\sigma}'(\mathbf{F},T) = k_{\mathrm{B}}T\frac{N}{\det(\mathbf{F})}\left(\frac{I_{\mathrm{lim}}}{I_{\mathrm{lim}}-(\mathrm{Tr}(\mathbf{F}\mathbf{F}^T)-3)}\mathbf{F}^T\mathbf{F}-\mathbf{I}\right)}$$

Flory-Huggins free energy relative to the reference volume

$$\boxed{w_{\mathrm{m}}(T,c) = k_{\mathrm{B}}T\left(c\ln(\Omega c)+\chi c(1-c\Omega)\right)}$$

with

$$\boxed{\chi(c) = \frac{1}{2}-A\left(1-\frac{\Theta}{T}\right)+\chi_2(1-\Omega c)+\chi_3(1-\Omega c)^2}$$

The osmotic pressure is given by

$$\boxed{\pi(c) = -\frac{1}{\Omega}\frac{\partial w_{\mathrm{m}}}{\partial c}}$$

2 Equilibrium

The total stress is given by

$$\boxed{\boldsymbol{\sigma} = \boldsymbol{\sigma}'(\mathbf{F},T)-\pi(c)\mathbf{I}}$$

we have to ensure the incompressibility as

$$\boxed{\det(\mathbf{F})(1-\Omega c) = \phi_0}$$

$$\boldsymbol{\sigma} = \frac{k_BTN}{\det(\mathbf{F})}\left(\frac{I_{\mathrm{lim}}}{I_{\mathrm{lim}}-(\mathrm{Tr}(\mathbf{F}\mathbf{F}^T)-3)}-\boldsymbol{I}\right)\mathbf{F}^T\mathbf{F}-\boldsymbol{\pi}\mathbf{(c)I}$$