Useful Equations

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1 Guidelines

Dump equations here with titles and with a brief blurb about what it is, assumptions it makes, etc

2 Heat Transfer Equations

2.1 Fourier's law of heat conduction

$$\boldsymbol{q} = -k\boldsymbol{\nabla}T \tag{1}$$

$\boldsymbol{q}$ is the local heat flux density Wm^2, k is the material's conductivity$\mathrm{Wm}^1\mathrm{K}^-1$, and in an anisotropic medium, k is a second order tensor that varies with location if the material is non-uniform T is the temperature Km^-1

2.2 Thermal Current Conservation

$$\nabla \cdot \boldsymbol{q}(\boldsymbol{x}, t) + \frac{k}{\alpha}\frac{\partial T}{\partial t}(\boldsymbol{x}, t) = S(\boldsymbol{x}, t) \tag{2}$$

$\boldsymbol{q}$ is the local heat flux density, α is $k = \frac{k}{\rho c}$ where c is the specific heat, and ρ is the density

2.3 Parabolic Heat Transfer Equation

$$\nabla \cdot \boldsymbol{q}(\boldsymbol{x}, t) + \frac{k}{\alpha}\frac{\partial T}{\partial t}(\boldsymbol{x}, t) = S(\boldsymbol{x}, t) \tag{3}$$

Assuming thermal current conservation and Fourier's law hold directly yieldsthis

2.4 Pennes Bioheat Equation

$$S(\boldsymbol{x}, t) = S_s(\boldsymbol{x}, t) + S_p(\boldsymbol{x}, t) + S_m(\boldsymbol{x}, t) \tag{4}$$