

$$\begin{aligned}
\text{f (objective function)} &= \begin{bmatrix} 0 & 1 & 0 & 0 \end{bmatrix} \\
\text{Processes} &= \begin{bmatrix} \text{Metabolism} \\ \text{Ribosomes} \\ \text{Chaperones} \end{bmatrix} \times \begin{bmatrix} S & \mu C_E & \mu C_R & \mu C_C \\ \mu \text{PCR}_E & \mu \text{PCR}_R & \mu \text{PCR}_C \\ \mu \text{PCC}_E & \mu \text{PCC}_R & \mu \text{PCC}_C \end{bmatrix} \\
&= \mathbf{A}_{eq} = \mathbf{b}_{eq} = - \begin{bmatrix} \mu C_G & \mu C_{Xc} & \mu C_{Xm} & C_{mrna} \\ \mu \text{PCR}_G \\ \mu \text{PCC}_G \end{bmatrix} \\
&\times \begin{bmatrix} \text{nu} & \mathbf{E} & \mathbf{R} & \mathbf{C} \end{bmatrix} \times \begin{bmatrix} \text{PG} & Xc & Xmetab & Xmrna \end{bmatrix} \\
\\
\text{Density constraints (Cytosol, membrane, etc.)} &= \begin{bmatrix} \text{Flux} \\ \text{Flux} \end{bmatrix} \times \begin{bmatrix} I & -\text{diag}(kE) \\ -I & -\text{diag}(kE) \end{bmatrix} \\
&= \mathbf{A} \leq \mathbf{b} = \begin{bmatrix} D \end{bmatrix} \times \begin{bmatrix} W_G \\ W_{mrna} \end{bmatrix} \\
&\times \begin{bmatrix} \text{nu} & \mathbf{E} & \mathbf{R} & \mathbf{C} \end{bmatrix} \times \begin{bmatrix} \text{PG} & Xc & Xmetab & Xmrna \end{bmatrix}
\end{aligned}$$