Задача Зельдовича-Тиле

$$f=\frac{2\pi Rk_{хим}\times 2\int_0^L\left[A(x)\right]dx}{2\pi rk_{хим}2L\times\left[A_0\right]}=\frac{\int_0^L\left[A(x)\right]dx}{L\times\left[A_0\right]} \tag{1}$$

$$D(A)\times\left(\frac{d^2[A(x)]}{dx^2}\right)\times R=2k_{хим}[A] \tag{2}$$

$$\xi=\frac{[A(x)]}{\left[A_0\right]},\qquad \eta=\left(\frac{2k_{хим}}{D(A)\times R}\right)^{\frac{1}{2}}x$$

$$d^2\xi=\frac{d^2[A(x)]}{\left[A_0\right]},\qquad d\eta=\left(\frac{2k_{хим}}{D(A)\times R}\right)^{\frac{1}{2}}dx,$$

$$d\eta^2=\left(\frac{2k_{хим}}{D(A)\times R}\right)dx^2 \tag{3}$$

$$\frac{d^2\xi}{d\eta^2}=\xi \tag{4}$$

$$\psi=\eta(L)=\left(\frac{2k_{хим}}{D(A)\times R}\right)^{\frac{1}{2}}\times L,$$

$$\eta(x)=\frac{\psi}{L}\times x;\quad d\eta=\frac{\psi}{L}dx;\ dx=\frac{L}{\psi}d\eta \tag{5}$$

$$\xi(\eta) = C_1 e^{\eta} + C_2 e^{-\eta} \tag{6}$$

$$C_1 = \frac{e^{-\psi}}{e^{-\psi} + e^{\psi}}, \quad C_2 = \frac{e^{\psi}}{e^{-\psi} + e^{\psi}}$$

$$\xi(\eta) = \frac{e^{\eta-\psi}}{e^{-\psi} + e^{\psi}} + \frac{e^{\psi-\eta}}{e^{-\psi} + e^{\psi}} = \frac{e^{\eta-\psi} + e^{-(\eta-\psi)}}{e^{-\psi} + e^{\psi}} \tag{7}$$

$$\xi(\eta) = \frac{e^{\eta-\psi} + e^{-(\eta-\psi)}}{e^{-\psi} + e^{\psi}} = \frac{ch(\eta-\psi)}{ch(\psi)} \tag{8}$$

$$f = \frac{\int_0^L [A](x)dx}{L \times [A_0]} = \frac{\int_0^\psi [A_0] \frac{L}{\psi} \frac{ch(\eta-\psi)}{ch(\psi)} d\eta}{L \times [A_0]} = \frac{L \times [A_0] \times \int_0^\psi ch(\eta-\psi) d\eta}{L \times [A_0] \times \psi \times ch(\psi)} =$$

$$= \frac{\left. sh(\eta-\psi) \right|_0^\psi}{\psi \times ch(\psi)} = \frac{0 - sh(-\psi)}{\psi \times ch(\psi)} = \frac{sh(\psi)}{\psi \times ch(\psi)} = \frac{th(\psi)}{\psi}$$

(9)

$$\ln k_{эфф} = \ln k_{хим} + \ln\{th(\psi)\} - \ln(\psi) + const \tag{10}$$