1. Sensitivity analysis

$$\frac{dx_A}{dt} = \frac{rV}{N_{A,0}} \tag{1}$$

$$\frac{dV}{dt} = u \tag{2}$$

$$r = \frac{k^\circ \exp\left(\frac{-E_a}{RT}\right) N_A^{\alpha_A} N_B^{\alpha_B}}{V^2} \tag{3}$$

$$N_A = N_{A,0}\left(1 - x_A\right) \tag{4}$$

$$N_B = C_{B,in}(V - V_{A,0}) - N_{A,0}x_A \tag{5}$$

$$q_{rx} = r(-\Delta H_r)V, \tag{6}$$

$$\frac{\partial r}{\partial k^\circ} = r\left(\frac{1}{k^\circ} - \left(\frac{\alpha_A}{N_A} + \frac{\alpha_B}{N_B}\right) N_{A,0}\frac{\partial x_A}{\partial k^\circ}\right) \tag{7}$$

$$\frac{\partial r}{\partial E_a} = r\left(\frac{-1}{RT} - \left(\frac{\alpha_A}{N_A} + \frac{\alpha_B}{N_B}\right) N_{A,0}\frac{\partial x_A}{\partial E_a}\right) \tag{8}$$

$$\frac{\partial r}{\partial \alpha_A} = r\left(\ln N_A - \left(\frac{\alpha_A}{N_A} + \frac{\alpha_B}{N_B}\right) N_{A,0}\frac{\partial x_A}{\partial \alpha_A}\right) \tag{9}$$

$$\frac{\partial r}{\partial \alpha_B} = r\left(\ln N_B - \left(\frac{\alpha_A}{N_A} + \frac{\alpha_B}{N_B}\right) N_{A,0}\frac{\partial x_A}{\partial \alpha_B}\right) \tag{10}$$