Kovács Nagor
Kovszeat. elte

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1) $\lg p = 5 - h/15500$

$\lg p = 5 - 2{,}52$

$\lg p = 2{,}48$

$p = 301\ Pa$ $\quad T = 269{,}35$

$CH_3C(O)O_2 + NO_2 \xrightarrow{k} CH_3C(O)CH_2NO_2$

$k^0 = 9 \cdot 10^{-28} \cdot \left(\frac{T}{300}\right)^{-8.9} = 9 \cdot 10^{-28} \cdot (0{,}897)^{-8.9} = 2{,}37 \cdot 10^{-27}$ $cm^6\ molekula^{-2}\ s^{-1}$

$k^\infty = 7{,}7 \cdot 10^{-12} \cdot \left(\frac{T}{300}\right)^{-0{,}2} = 7{,}7 \cdot 10^{-12} \cdot (0{,}897)^{-0{,}2} = 7{,}87 \cdot 10^{-12}$ $cm^3\ molekula^{-1}\ s^{-1}$

$[M] = \frac{n}{V} = \frac{p}{RT} = \frac{301}{8{,}314 \cdot 269{,}35} = 0{,}134\ \frac{mol}{m^3} = 8 \cdot 10^{22}\ \frac{molekula}{m^3} = 8 \cdot 10^{16}\ \frac{molek}{cm^3}$

$P_r = \frac{k_0[M]}{k^\infty} = \frac{2{,}37 \cdot 10^{-27} \cdot 8 \cdot 10^{16}}{7{,}87 \cdot 10^{-12}} = 24{,}1$ ✓

$k = \frac{P_r}{1+P_r} \cdot k_\infty = 0{,}96 \cdot 7{,}87 \cdot 10^{-12} = 7{,}55 \cdot 10^{-12}$ $cm^3\ molekula^{-1}\ s^{-1}$

2) R2 $\rightarrow$ $k_2(300K) = 6 \cdot 10^{-34}\ cm^3/(molek^{+2} \cdot s)$

$n = 2{,}4$

$T = 269{,}35$

$k_2(269{,}35K) \rightarrow 6 \cdot 10^{-34} \cdot \left(\frac{269{,}35}{300}\right)^{-2{,}4}$

$k_2 = 7{,}78 \cdot 10^{-34}\ cm^6/(molekula^2 \cdot s)$

R4 $\rightarrow$ $A = 8 \cdot 10^{-12}\ cm^3\ molekula^{-1}\ s^{-1}$ $\quad E/R = 2060K$

$E = 17126{,}8\ J$

$k_4 = 8 \cdot 10^{-12} \cdot e^{-\frac{17126{,}8}{8{,}314 \cdot 269{,}35}} = 3{,}81 \cdot 10^{-15}\ cm^3\ molekula^{-1}\ s^{-1}$

c) $R2 = R3$

$v_{R_2} = v_{R_3}$

$$\frac{d[O]}{dt} = k_1[O_2] - k_2[O][O_2][M] + k_3[O_3] - k_4[O][O_3]$$

$$k_2[O][O_2][M] = k_3[O_3]$$

$$[O] = \frac{k_3[O_3]}{k_2[O_2][M]}$$

d) $[O_3] \rightarrow$

$v_{R1} = v_{R4}$

$$\frac{d[O_3]}{dt} = k_2[O][O_2][M] - k_4[O][O_3]$$

$$k_1[O_2] = k_4[O][O_3]$$

$$[O_3] = \frac{k_1[O_2]}{k_4[O]}$$

e) $$[O_3] = \frac{k_1[O_2]}{k_4 \cdot \frac{k_3[O_3]}{k_2[O_2][M]}} = \frac{k_1 k_2 [O_2]^2 [M]}{k_3 \cdot k_4 [O_3]} = [O_3]$$

$$[O_3]^2 = \frac{k_1 k_2 [O_2]^2 [M]}{k_3 \cdot k_4}$$

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② folytatás

$$\frac{k_1 \cdot [O_2] \cdot k_2 [O_2] \cdot [M]}{k_4 \cdot k_3 \cdot [O_3]} = [O_3]$$

$$\frac{k_1 k_2 [O_2]^2 [M]}{k_4 k_3} = [O_3]^2$$

$$[O_3] = \sqrt{\frac{k_1 k_2}{k_3 k_4} \cdot [O_2]^2 \cdot [M]}$$

Tegyük fel, hogy a levegő 21 V/V% O_2 + katalizátor

$$[M] = \frac{n}{R \cdot T} \cdot 10^6 \cdot 1 = \frac{302,67 \text{ Pa}}{8,314 \cdot 269,35} \cdot 6 \cdot 10^{23} \cdot 10^{-6} = 8,109 \cdot 10^{16} \frac{\text{molekula}}{cm^3}$$

$$[O_2] = \frac{n}{R \cdot T \cdot 10^6} \cdot 0,21 = 1,703 \cdot 10^{16} \frac{\text{molekula}}{cm^3}$$

$$[O_3] = \sqrt{\frac{6 \cdot 10^{-11} \cdot 7,771 \cdot 10^{-34}}{10^{-3} \cdot 3,815 \cdot 10^{-17}} \cdot 8,109 \cdot 10^{16} \cdot (1,703 \cdot 10^{16})^2} = 5,3612 \cdot 10^{11} \frac{\text{molekula}}{cm^3}$$