# Acca Edilus Ca Ac Mu V20 00 Crack 231

* Can also use $\tau_{rxn} = \frac{(1.5\ \frac{g}{cm^3})(0.05\ cm)(\frac{1}{12})}{(1)(k'')(C_{Ag})} = 3600 \Rightarrow k'' \doteq 0.54\ \frac{cm}{s}$

$C_{Ag}$: $3.3\times10^{-6}$ mol/cm$^3$

2. (50%) A 1-mm spherical carbon particle ($\rho$=1.5 g/cm$^3$) reacts with oxygen from the air (total pressure = 1 atm; 21% $O_2$) according to the shrinking core model at 500 °C. The gas-phase mass transfer coefficient is 200 cm/s (see Appendix). The chemical reaction rate constant is 0.2 cm/s (based on the external surface area of the particle). The effective diffusivity of $O_2$ in the ash layer is unknown, but it is expected that ash layer diffusion is the RDS. Estimate the value of the effective diffusivity, by assuming that the ash-layer resistance term is at least a factor of 10 larger than the larger of the other two resistances. Is this a reasonable value?

*Bonus. Let's understand the value of 0.2 cm/s for the chemical reaction rate constant. Show that this value means the following: If the reaction is 1st order with respect to $O_2$, 100% of the carbon would be consumed in 1 h.*
*Hint: 100% carbon consumption in 1 h means that the (average) rate is 1 g C/g C/h.*

$$\text{Rate} = \frac{C_A}{\frac{1}{k_g} + \frac{R}{2D_e} + \frac{3}{k''}} \left[\frac{mol\ O_2}{cm^2\cdot s}\right] \qquad D_e = ?$$

(external surface area!) +10

$$\frac{1}{k_g} = 0.005\ \frac{s}{cm}\ (+10);\quad \frac{3}{k''} = \frac{3}{0.2} = 15\ \frac{s}{cm}\ (+10) \Rightarrow \frac{R}{2D_e} \geq 150\ \frac{s}{cm}$$

$$\therefore D_e \leq \frac{0.05\ cm}{300\ \frac{s}{cm}} = 1.7\times10^{-4}\ \frac{cm^2}{s} = 1.7\times10^{-8}\ \frac{m^2}{s}\ \ +10$$

+10 OK, see Appendix, p. 657

Note: The same result is obtained if used $\tau_{rxn}, \tau_{diff}, \tau_{ash}$ as the resistances.

$$\text{Rate} = k''C_A \Rightarrow k'' = \frac{\text{Rate}}{C_A} = \frac{1\ \frac{gC}{gC\cdot h}\ \frac{1\ mol\ C}{12\ gC}\ \frac{1\ mol\ O_2}{1\ mol\ C}\ \frac{1\ h}{3600\ s}}{0.21\ atm\ \frac{1}{(82.06\ \frac{atm\cdot cm^3}{mol\cdot K})(773\ K)}} =$$

* (vs. $k''/3$)

$$\doteq \left(7.0\ \frac{cm^3}{gC\cdot s}\right)\left(X\ \frac{gC}{cm^2}\right) \doteq 0.18\ \frac{cm}{s}\ (OK)$$

$$\frac{d_p\rho}{6} = \frac{(0.1\ cm)(1.5\ \frac{g}{cm^3})}{6} = 0.025\ \left(40\ \frac{cm^2}{g}\right)$$

UPDATE: 1 sec ago

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