Lec 4 Example

$T_{coul} = 580\,K$ $\quad LHR = 200\ W/cm$ $\quad h_{coul} = 2.65\ \frac{W}{cm^2 K}$

$R_f = 0.5\ cm$ $\quad t_c = 0.06\ cm$ $\quad t_g = 0.003\ cm$ $\quad k_f = 0.03\ \frac{W}{cm\cdot K}$ $\quad k_c = 0.17\ \frac{W}{cm\cdot K}$

$$T_{co} - T_{coul} = \frac{LHR}{2\pi R_f h_{coul}} = \frac{200}{2\pi(0.5)}\frac{1}{2.65} = 24\,K$$

$$T_{co} = 604\,K$$

$$T_{ci} - T_{co} = \frac{LHR}{2\pi R_f}\frac{t_c}{k_c} = \frac{200}{2\pi(0.5)}\frac{0.06}{0.17} = 22.5\,K$$

$$T_{ci} = 626.5\,K$$

$$T_s - T_{ci} = \frac{LHR}{2\pi R_f}\frac{t_g}{k_g}$$

$$k_g(T_{ci}) = 16\times10^{-6}\,T_{ci}^{0.79} = 0.0026\ \frac{W}{cm\cdot K}$$

$$T_s - T_{ci} = \frac{200}{2\pi(0.5)}\frac{0.003}{0.0026} = 73.8\,K \qquad T_s = 700.3\,K$$

$$T_o - T_s = \frac{LHR}{4\pi k_f} = \frac{200}{4\pi(0.03)} = 530.5\,K$$

$$T_o = 1230.8\,K$$

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