

Week6 YUYUE

1.Considering the same example you solved in the previous assignment (radiative heat transfer between two parallel plates), how many shields with epsilon = 0.1 should you add in order to have the new heat transfer rate to be 1% of the case without shields ?

$$q^{net_{1-2}} = \frac{\dot{Q}_{net_{1-2}}}{A} = \frac{A\sigma(T_2^4 - T_1^4)}{\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1} / A = \frac{(5.67 * 10^{-8}) * (800^4 - 500^4)}{\frac{1}{0.1} + \frac{1}{0.1} - 1}$$
$$= 1036 W/m^2$$

$$q^{net_{1-2,shields}} = \frac{\dot{Q}_{net_{1-2}}}{A} = \frac{A\sigma(T_2^4 - T_1^4)}{(n+1)\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1} / A$$

$$\frac{\sigma(T_2^4 - T_1^4)}{(n+1)\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1} = \frac{\sigma(T_2^4 - T_1^4)}{(100)\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1}$$

$$N=99$$