

Week 5 Exercise:

- Write a summary of the topics about radiative heat transfer we went through including the definitions of emissivity, absorptivity and reflectivity, the view factor, the heat exchange between two black surfaces, the heat exchange between the two gray surfaces and finally the definition of radiative resistances.

Emissivity

Is the ratio of the thermal radiation from a surface to the radiation from an ideal black surface at the same temperature.

Absorptivity

Is the fraction of total energy absorbed by the body.

Reflectivity

Reflectivity (ρ): is the fraction of irradiation reflected by the surface, which always occurs on the surface itself.

The View Factor

Is the fraction of radiation emitted by one surface which is received by a second surface.

The heat exchange between two black surfaces

Depending on how heat/energy each black surface is holding, they will also be absorbing whatever is emitted by the other without reflecting anything.

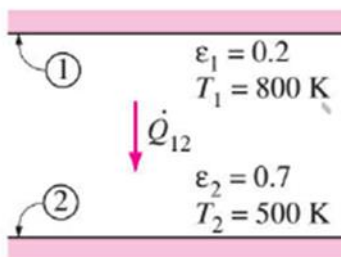
The heat exchange between the two gray surfaces

the surfaces will be absorbing some of what is emitted while reflecting some of it as well.

Radiative Resistances

Is the ability of a surface, or material to resist gaining radiation or passing it through depending on its thermal resistance properties such as how much its insulating or conducting depending on the need of it.

-Find the radiative heat exchange between two parallel plates considering the two emissivities to be 0.1. What can you conclude from the result?



if $\epsilon_1 = 0.2$; $\epsilon_2 = 0.7$

$$R_{\text{Total}} = 1/0.2 + 1/0.7 - 1 = 5.43$$

$$\dot{Q}_{12} = A\sigma (T_1^4 - T_2^4) / (1/\epsilon_1 + 1/\epsilon_2 - 1) = (A * (5.67 * 10^{-8})) * (800^4 - 500^4) / (1/0.2 + 1/0.7 - 1) = 3625.4 * A \text{ W}$$

if $\epsilon_1 = \epsilon_2 = 0.1$;

$$R_{\text{Total}} = 1/0.1 + 1/0.1 - 1 = 19$$

$$\dot{Q}_{12} = (A * (5.67 * 10^{-8})) * (800^4 - 500^4) / (1/0.1 + 1/0.1 - 1) = 1035.8 * A \text{ W}$$