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Question：

Task 1: In you own words (which means in your own words) 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 betweeen two black surfaces,the heat exchange between the two gray surface and finally the definition of radiative resistances.

Emissivity

Emissivity is the ability to determine the intensity of heat radiation generated by the surface of an object. Under the same conditions, the ratio of the thermal radiation intensity of an object to the thermal radiation intensity of a black body is the radiance of the object. Since the black body is a model, the black body has an emissivity of 1. The radiance of other objects varies from 0 to 1. In reality, there will be no 1 value.

Absorptivity

Thermal radiation is the same as other heat transfer methods. When

heat radiation acts on an object, the object will enter the surface and absorb a part of the heat radiation to generate heat. The ratio of the absorbed energy to the energy of the thermal radiation.

Reflectivity

The reflectivity is similar to that of light energy. In addition to absorption, thermal radiation is reflected by thermal radiation, which is the ratio of the reflected energy of the object to the energy of the heat radiation. The general absorptivity rate and reflectivity are added to be 1.

the heat exchange betweeen two black surfaces

Starting from the first object, this object is a black surface, and the heat radiation energy it produces is $A_1 \times E_{b1} \times F_{1\to 2}$ .And act on another object. But at the same time, because another object is also a black surface, it also reflects energy $A_2 \times E_{b2} \times F_{2\to 1}$ at the same time. Two black surfaces will be produced the net radiative heat exchange. It is $A_1 \times E_{b1} \times F_{1\to 2} - A_2 \times E_{b2} \times F_{2\to 1}$.

the heat exchange between the two gray surface

Gray surface should consider their Emissivity. When Absorptivity and reflectivity can be added to 1. We can see that $\dot{Q}_i = A_i \times (J_i - G_i)$. And

finally we can make a conclusion $\dot{Q}_i = A_i \times \varepsilon_i / (1 - \varepsilon_i) \times (E_b - J_i)$.

Radiative Resistances

Radiative Resistances is the energy lost in thermal radiation. Generally, the surface of the object in thermal radiation is a way of resistance. In addition, the wavelength is also an important factor.

Task 2: Solve the last example you solved in the class (radiative heat exchange between two parallel plates) awhile considering the two emissivities to be 0.1, what can you conclude from the result?

Net radiative heat exchange between surface 1 2.

$A_1 = 1.5\text{m}^2$

$\varepsilon_1 = 0.1 = \varepsilon_2$

$T_1 = 298K$

$T_2 = 308K$

$\sigma = 5.67 \times 10^{-8}$

$$\dot{Q}_{12} = A_1 \times \sigma \times \frac{(T_1^4 - T_4^4)}{(\frac{1}{\varepsilon_1}) + (\frac{1}{\varepsilon_2}) - 1} = -4.982W$$

The less of Emissivity the less of Heat Transfer.