Submission 5

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12:38

SUMMARY OF HEAT TRANSFER

DEFINITION OF EMISSIVITY

The emissivity(ε) of the surface of a material refers to the surface's ability to emit
energy as thermal radiation.
The emissivity is defined mathematically as the ratio between the thermal radiation of a surface from the
The higher the emissivity value, the closer the surface is to a black body (ε= 1).
The emissivity of a real surface is influenced by the surface temperature and the wavelength and the direction of the waves.

DEFINITION OF
The reflectance(ρ) of the surface of a material is its effectiveness in reflecting radiant energy. It is the
fraction of total energy transmitted by the body, the ratio of reflected radiation to reflected radiation is used.
The ratio between the reflected radiation and the reflected radiation used to calculate the absorption value, which varies from 0 to 1.

Absorptivity:
<u>Definition:</u>
A measure of a substance's ability to absorb light at a given wavelength, expressed by the symbol epsilon.
For a medium with selective absorption in the visible light region, it represents the sensitivity of a certain color reaction. For the same measured element, the greater the sensitivity, the more sensitive the color reaction will be. For the same color reaction, the sensitivity is related to the measured concentration. The molar absorption coefficient usually refers to the molar absorption coefficient at the maximum absorption wavelength.

Radiative Resistances:
The radiative resistance is a value used to measure the loss

energy, and the loss energy is converted into heat radiation; the energy lost by the radiative resistance is converted into radio waves.

Task2: 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?

Question:

Find the net heat exchange between the surface 1 and 2 where A1 1.5 m2, F12 = 0.01, T1 = 298 K, T2 = 308 K, ϵ_1=0.1, ϵ_2=0.1, σ= 5.67*10-8$\frac{W}{m^2 \cdot K4}$.

Solve the last example 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?

Solution:

$$\dot{Q}_{1\to 2} = \frac{A_1 \sigma \left(T_1^4 - T_2^4\right)}{\frac{1}{\epsilon_1}+\frac{1}{\epsilon_2}-1} = \frac{1.5 * \mathbf{5.67} * 10^{-8} * \left(308^4 - 298^4\right)}{\frac{1}{0.1}+\frac{1}{0.1}-1} = 4.9821\text{W}$$

$$F_{12} = \frac{1}{\frac{1}{\epsilon_1}+\frac{1}{\epsilon_2}-1} = \frac{1}{\frac{1}{0.1}+\frac{1}{0.1}-1} = 0.0526$$

The example solved in the class:

F_{12} = 0.01

$\dot{Q}_{1\to 2} = A_1 \times F_{12} \times \sigma\ (T_1^4 - T_2^4)$ =1.5*0.01*5.67*10-8*(2984-3084) =-0.9466 W

$\dot{Q}_{2\to 1} = -\dot{Q}_{1\to 2}$ = 0.9466 W