Week 5 Mohammad javad mollaiyan

Monday, November 4, 2019 10:38 PM

Emissivity:

is ratio of emitted radiation of surface to emitted radiation of blackbody at same temperature which is between 0 and 1 . emissivity of blackbody is 1 . the emissivity is different from surface temperature and wavelength direction of it .

absorptivity:

is the ratio of absorbed radiation to incident radian that hitting surface and it is between 0 and 1. For most of the object we have absorptivity which means some amount of the radiation will absorbed by their surface .

reflectivity:

the ratio of amount of radiation reflected by surface to incident radiation that hit the surface . this amount is between 0 and 1 and most of gloss surface have this and more reflectivity of the surface means the radiation reflection of surface will be more and less and less will be absorbed.

Mirror is good example of the reflective surface .

Transmissivity :

is the ratio of transmitted radiation to incident radiation that hit the surface . the amount of this is between 0 and 1 and if the surface of the object be more transparent and let the radiation go through it this number become grater . glass is one of best example that allows radiation mostly go through it .

view factor:

this factor is geometrical quantity and it is the fraction of radiation leaving the surface A and hit the surface B . the amount of this do not related to surface property . it is more angel factor which means the factor base on angel of leaving first surface and angel of hitting second surface.

heat exchange between two black surfaces:

in black surface the equation is base on radiation leaving surface 1 and hit surface 2 minus the radiation leave the surface 2 and hit surface 1 . because all the radiation is emitted by surfaces . this equation is base on A and E and F as view factor . in other word we can define it as:

$$\dot{Q}_i = \sum_{j=1}^{N} \dot{Q}_{i\to j} = \sum_{j=1}^{N} A_i F_{i\to j} \sigma (T_i^4 - T_j^4)$$

heat exchange between the two gray surface:

in the gray surface because we have more variables we have to calculate them all so heat exchanges between 2 gray surface will have only 1 general different which is in each part we have to count radiation emitted by surface A and the radiation reflected by surface A at the same time and summation of them are the answer .

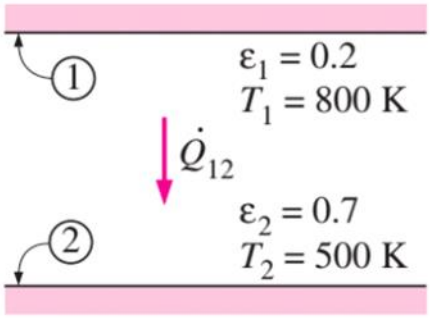
radiative resistances:

it is generally the value to calculate the energy that release from resistance which converted to heat radiation . more resistance can make more heat radiation .

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

Find the net heat exchange between the surface 1 and 2 where
A1 = 1.5 m^2, , T__1 = 800K, T_2 = 500K

$$\sigma = 5.67 * 10^{-8} \frac{W}{m^2 K^4}$$



$$Q_{12} = \frac{A\sigma(T_1^4 - T_2^4)}{\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1}$$

29520,855

First with old data: $Q_{old\ 12} = \frac{1{,}5 \times 5{,}67 \times 10^{-8}(800^4 - 500^4)}{\frac{1}{0{,}2} + \frac{1}{0{,}7} - 1} = 5438{,}0522$

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second the $\varepsilon_1 = \varepsilon_2 = 0{,}1$: $Q_{12} = \frac{1{,}5 \times 5{,}67 \times 10^{-8}(800^4 - 500^4)}{\frac{1}{0{,}1} + \frac{1}{0{,}1} - 1} = 1553{,}7992$

The lower the emissivity of surface will cause less heat transfer . From first value we can see more emissivity that surface have make the heat transfer more and in the new data we see lower the emissivity less heat transfer