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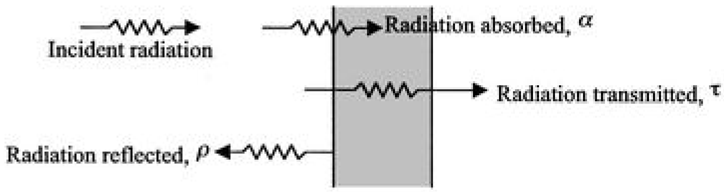
1.**Radiation Heat Transfer (Heat transfer by thermal radiation):**

All bodies radiate energy in the form of photons moving in a random direction, with random phase and frequency. When radiated photons reach another surface, they may either be absorbed, reflected or transmitted. The behavior of a surface with radiation incident upon it can be described by the following quantities:

α= absorptance - fraction of incident radiation absorbed
ρ= reflectance - fraction of incident radiation reflected
τ= transmittance - fraction of incident radiation transmitted.



Emassivity is the ratio of the total amount of radiation emitted by a body to that of an ideal black body emitting the same temperature. This is a dimensionless size, usually marked with the Greek letter ε.Its value can range from 0 ≤ε ≤1, where the emissivity of an ideal black body is 1, meaning the body absorbs all the radiation it hits, and emits energy on it. According to Planck Law (black body radiation).

Emassivity depends on the temperature, wavelength, material and angle of radiation. It is sometimes assumed that this is a constant (or average) parameter and its value is assumed to be independent of wavelength: measure the ratio of total body energy emitted at all wavelengths to the total energy emitted by a black body at all wavelengths. This is a good approximation when the goal is to find average values in a wide range of wavelengths, such as a black-and-white camera that includes the entire visible wavelength range and close sub-red. A body having a chill between 0 <ε <1, which does not depend on wavelength and angle, is called a gray body

Irradiation

The radiation flux incident on a surface is called irradiation and is denoted by G.

When radiation strikes a surface, part of it is absorbed, part of it is reflected, and the remaining part, if any, is transmitted, as illustrated above Figure.

Absorptivity

The fraction of irradiation absorbed by the surface is called the absorptivity (α). It is the ratio of absorbed radiation (G abs) to incident radiation (G).

Its value: $0 \leq \alpha \leq 1$

Reflectivity

The fraction of radiation reflected by the surface is called the reflectivity (ρ). It is the ratio of reflected radiation (G ref) to incident radiation (G).

Its value: $0 \leq \rho \leq 1$

Transmissivity

The fraction of radiation transmitted is called the transmissivity (τ). It is the ratio of transmitted radiation (G tr) to incident radiation (G).

Its value: $0 \leq \tau \leq 1$

The first law of thermodynamics requires that the sum of the absorbed, reflected, and transmitted radiation energy be equal to the incident radiation. That is,

$G_{abs} + G_{ref} + G_{tr} = G$

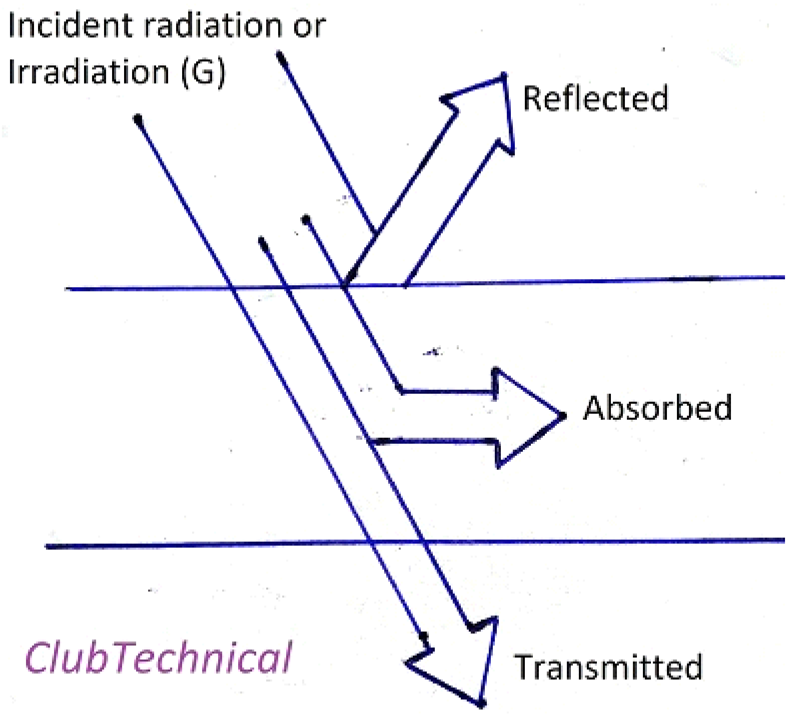
Dividing each term of this relation by G yields

$\alpha+\rho+\tau=1$

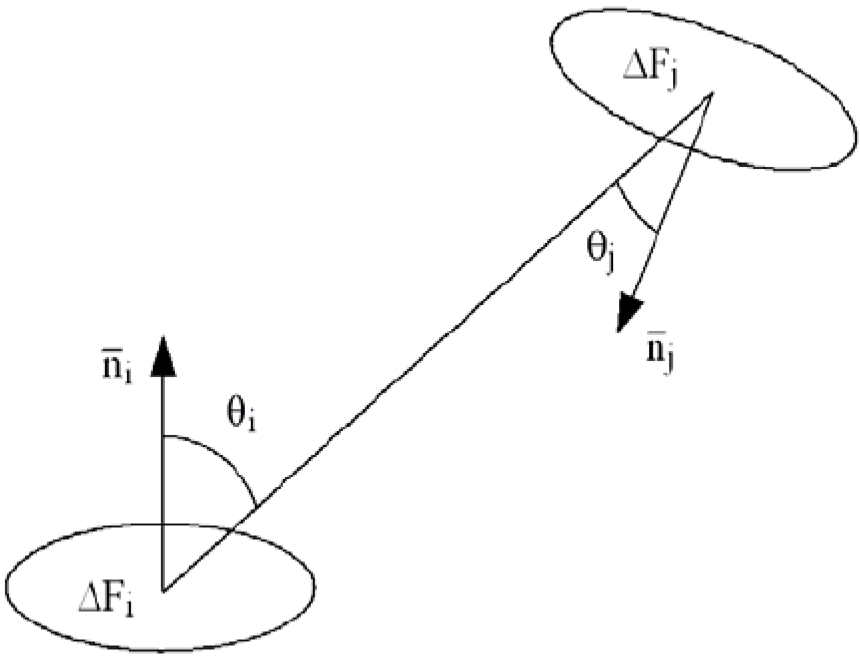
For opaque surfaces, $\tau=0$, and thus

$\alpha+\rho=1$

This is an important property relation since it enables us to determine both the absorptivity and reflectivity of an opaque surface by measuring either of these properties



view factor,$F_{1\rightarrow 2}$, is the proportion of the radiation which leaves surface A that strikes surface B. In a complex 'scene' there can be any number of different objects, which can be divided in turn into even more surfaces and surface segments.
View factors are also sometimes known as **configuration factors**, **form factors**, **angle factors** or **shape factors**.

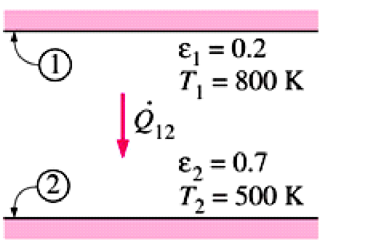


2. Calculate the heat exchange between the two parallel plates:

Where

A=1.5 m^2 ε1 =0.2 ε2 =0.7 T1=800K T2=500K σ=5.67*10^{-8}

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



$$\dot{Q}_{12} = \frac{1.5 * 5.670 * 10^{-8} * (800^4 - 500^4)}{\frac{1}{0.2} + \frac{1}{0.7} - 1} = 5438.05 \text{ W}$$

If the two emissivities of the plates are 0.1:

$$\dot{Q}_{12} = \frac{1.5 * 5.670 * 10^{-8} * (800^4 - 500^4)}{\frac{1}{0.1} + \frac{1}{0.1} - 1} = 1553.72 \text{ W}$$

When $F_{1\text{-}2}$=0.01

$\dot{Q}_{net\ 1\text{-}2=\text{-}1}$ $AF_{1\text{-}2}$*$\sigma(T^4_1 - T^4_2)$ $1.5 * 5.670 * 10^{-8} * (800^4 - 500^4) = 29520.855\ W$

$$\frac{1}{\frac{1}{0.2} + \frac{1}{0.7} - 1} = 0.0526$$

increasing the emissivity it also increases the heat exchange between the two parallel plates. And the value of emessivity would affect the radiative heat exchange between the two surface.