RADIATION

Shivam Bansal
Mechanical Department
Dronacharya College of Engineering
Khentawas, Farukhnagar,Gurgaon
Email-shivamb990@gmail.com

Yogesh Vashiath
Mechanical Department
Dronacharya College of Engineering
Khentawas, Farukhnagar,Gurgaon
Email-yogeshvashiath.vash40@gmail.com

Ujjwal Batra
Mechanical Department
Dronacharya College of Engineering
Khentawas, Farukhnagar,Gurgaon
Email-ujjwal28@gmail.com

INTRODUCTION

Radiation is energy that comes from a source and travels through some material or through space. Light, heat and sound are types of radiation. The kind of radiation discussed in this presentation is called ionizing radiation because it can produce charged particles (ions) in matter.

Ionizing radiation is produced by unstable atoms. Unstable atoms differ from stable atoms because they have an excess of energy or mass or both.

Unstable atoms are said to be radioactive. In order to reach stability, these atoms give off, or emit, the excess energy or mass. These emissions are called radiation. The kinds of radiation are electromagnetic (like light) and particulate (i.e., mass given off with the energy of motion). Gamma radiation and X-rays are examples of electromagnetic radiation. Beta and alpha radiation are examples of particulate radiation. Ionizing radiation can also be produced by devices such as X-ray machines.

Radiation is the emission or transmission of energy in the form of waves or particles through space or through a material medium.[1][2] This includes electro-magnetic radiation such as radio waves,visible light, and x-rays, particle radiation such as α, β, and neutron radiation and acoustic radiation

such as ultrasound, sound, and seismic waves. Radiation may also refer to the energy, waves, or particles being radiated.

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.

A black body is defined as a body that absorbs all radiation that falls on its surface. Actual black bodies don't exist in nature - though its characteristics are approximated by a hole in a box filled with highly absorptive material. The emission spectrum of such a black body was first fully described by Max Planck.

A black body is a hypothetic body that completely absorbs all wavelengths of thermal radiation incident on it. Such bodies do not reflect light, and therefore appear black if their temperatures are low enough so as not to be self-luminous. All blackbodies heated to a given temperature emit thermal radiation.

HOW IS HEAT TRANSFERRED?

Heat can travel from one place to another in three ways: Conduction, Convection and Radiation. Both conduction and convection require matter to transfer heat.

If there is a temperature difference between two systems heat will always find a way to transfer from the higher to lower system.

1. CONDUCTION

Conduction is the transfer of heat between substances that are in direct contact with each other. The better the conductor, the more rapidly heat will be transferred. Metal is a good conduction of heat. Conduction occurs when a substance is heated, particles will gain more energy, and vibrate more. These molecules then bump into nearby particles and transfer some

of their energy to them. This then continues and passes the energy from the hot end down to the colder end of the substance.

Conduction occurs when two object at different temperatures are in contact with each other. Heat flows from the warmer to the cooler object until they are both at the same temperature. Conduction is the movement of heat through a substance by the collision of molecules. At the place where the two object touch, the faster-moving molecules of the warmer object collide with the slower moving molecules of the cooler object. As they collide, the faster molecules give up some of their energy to the slower molecules. The slower molecules gain more thermal energy and collide with other molecules in the cooler object. This process continues until heat energy from the warmer object spreads throughout the cooler object. Some substances conduct heat more easily than others. Solids are better conductor than liquids and liquids are better conductor than gases. Metals are very good conductors of heat, while air is very poor conductor of heat. You experience heat transfer by conduction whenever you touch something that is hotter or colder than your skin e.g. when you wash your hands in warm or cold water.

2. CONVECTION

Thermal energy is transferred from hot places to cold places by convection. Convection occurs when warmer areas of a liquid or gas rise to cooler areas in the liquid or gas. Cooler liquid or gas then takes the place of the warmer areas which have risen higher. This results in a continous circulation pattern. Water boiling in a pan is a good example of these convection currents. Another good example of convection is in the atmosphere. The earth's surface is warmed by the sun, the warm air rises and cool air moves in.

In liquids and gases, convection is usually the most efficient way to transfer heat. Convection occurs when warmer areas of a liquid or gas rise to cooler areas in the liquid or gas. As this happens, cooler liquid or gas takes the place of the warmer areas which have risen higher. This cycle results in a continous circulation pattern and heat is transfered to cooler areas. You see convection when you boil water in a pan. The bubbles of water that rise are the hotter parts of the water rising to the cooler area of water at the top of the pan. You have probably heard the expression "Hot air rises and cool air falls to take its place" - this is a description of convection in our atmosphere. Heat energy is transfered by the circulation of the air.

3. RADIATION

Radiation is a method of heat transfer that does not rely upon any contact between the heat source and the heated object as is the case with conduction and convection. Heat can be transmitted though empty space by thermal radiation often called infrared radiation. This is a type electromagnetic radiation . No mass is exchanged and no medium is required in the process of radiation. Examples of radiation is the heat from the sun, or heat released from the filament of a light bulb.

Both conduction and convection require matter to transfer heat. Radiation is a method of heat transfer that does not rely upon any contact between the heat source and the heated object. For example, we feel heat from the sun even though we are not touching it. Heat can be transmitted though empty space by thermal radiation. Thermal radiation (often called infrared radiation) is a typeelectromagnetic radiation (or light). Radiation is a form of energy transport consisting of electromagnetic waves traveling at the speed of light. No mass is exchanged and no medium is required.

REFERENCE

- https://orise.orau.gov/reacts/guide/define.htm
- http://web.mit.edu/16.unified/www/FALL/thermodynamics/notes/node133.html
- http://www.engineeringtoolbox.com/radiation-heat-transfer-d_431.html
- http://www.edinformatics.com/math_science/how_is_heat_transferred.htm
- http://coolcosmos.ipac.caltech.edu/cosmic_classroom/light_lessons/thermal/transfer.html