Electron Microscopy

Electron microscope is a system of electromagnetic coils where electron is used as source of light. Magnification of Electron microscope is very high. It gives magnification of 2000 times than that of light.

The first Electron microscope was designed by Knoll and Rusks (1932).

Principle :

In Electron microscope, an electron beam is used as source of light. An electron beam is produced by a filament heated at high voltage. Electrons were collected and focused on the object by electromagnetic coils. Object reflects electrons. The reflected electrons are collected and focused by electromagnetic objective lens and an image is formed. The image is magnified by electromagnetic projector lens which forms the final image of the object on photographic screen. Photograph thus formed is called electron micrograph. The entire system is in a vaccum tube.

Construction :

Electron microscope consists of following components :

a) Electron gun
b) Condenser lenses
c) Object
d) Objective lens
e) Amplifier lens
f) Projector lens
g) Fluorescent screen
h) Vaccum tube
i) Cooling system

Electron Gun:

It is source of illumination.It consists of V shaped filament and two circular metal plates with holes in centre, named as cathode and anode plate.High voltage is applied between the filament and the anode plate. A current flows through the filament and emits electrons. Electrons are attracted towards the anode plate and pass through the hole present in the middle of anode plate.

Condenser lenses:

There are two condenser lenses present one below the other. These are electromagnetic coils or lenses. They make the electron beam narrower and focus the beam in the direction of object.

Object :

Object is placed below the second condenser lens .Object is placed on a supporting film mounted on a copper grid.

Objective lens :

It is electromagnetic coil placed below the object. It captures the transmitted electrons from the object and magnifies the image.

Amplifier lens:

It amplifies the image produced by the objective lens.

Projector lens :

It projects the final image on screen.

Fluorescent Screen :

It receives the final image of object

Vaccum tube :

Entire set up is placed in a vaccum tube.

Cooling system :

Coils are cooled by water circulating around them.

Types of Electron Microscope :

1. Transmission Electron Microscope (TEM)

2. Scanning Electron Microscope (SEM)

3. Transmission Electron Microscope (TEM):

In Transmission Electron Microscope, electron beam is transmitted through the object. Staining is required in this microscopy.

Uses :

TEM is used to study structural details of microbes or any biological preparation.

Scanning Electron Microscope (SEM):

Scanning Electron Microscope is primarily used for studying surface architecture of specimen like Pollen grain, hairs etc. In SEM electron beam is scanned across the surface and three-dimensional image is formed.