
Advantages and disadvantages of the electron microscope

A beam of electron is used in electron microscope rather than visible light and this beam of electron is detected by an electron detector. An electron beam helps to view the very small areas of the specimen because it behaves same as light wavelength but the difference is that the wavelength of an electron beam is much smaller than that of visible light which allows seeing features up to nanometers.

History:

- Hans Busch was the first scientist who developed the electromagnetic lens in 1931.
- Ernst Ruska and Max Knoll constructed the prototype electron microscope in 1931, which contain four-hundred-power magnification.
- In 1933, Ruska built an electron microscope that rise above the resolution attainable with an optical (light) microscope. Reinhold Rudenberg and Siemens-Schuckertwerke both partner introduced the electron microscope in May 1931.

Principle:

Principle of the electron microscope is closely resembled to the bright microscope. It has large difference between the bright microscope and the electron microscope is that the user uses the lens and visible light source whereas the later uses electromagnetic lenses (doughnut-shaped electromagnets) and electron beam. The electrons can collide the air molecules and get deflected, which hinders the image formation. Hence, the microscope has an ultrahigh vacuum inside the tube.

Advantages

The very first advantage is its great magnification. Electron microscopes are aided in technological and industrial applications, such as semiconductor inspection, computer chip manufacturing, and quality control as well as in production line.

Disadvantages

They are very costly and very large in size so needed to be kept in a very large area. They are also very sensitive to vibration and external magnetic fields. They require stable voltage supplies, currents to electromagnetic lens and circulation of cool water so the samples are not

Need help with the assignment?

Our professionals are ready to assist with any writing!

GET HELP

harmful from heat given off during the process of energizing the electrons. Other than that they are required in high-end research laboratories.

Types of electron microscopy

The electron microscope is further divided into;

- Scanning Electron Microscope (SEM)
- The Transmission Electron Microscope (TEM)

The transmission electron microscope (TEM)

The first electron microscope developed was the transmission electron microscope (TEM). In TEM thin slices of samples are shot by a beam of electrons and then, those electrons are detected from other side. A thin section of a sample can be seen in very high resolution through TEM. It helps to study components inside a cell, such as organelles and their structures.

The scanning electron microscope (SEM)

The surface of three-dimensional objects in high resolution is seen under the scanning electron microscope (SEM). The focused beam of electrons scan the surface of an object and then, the electrons which are reflected back from the surface of samples are detected. SEM is good at forming three-dimensional images of lice, flies etc as the entire objects can be observed on the SEM at low magnifications.

Need help with the assignment?

Our professionals are ready to assist with any writing!

GET HELP