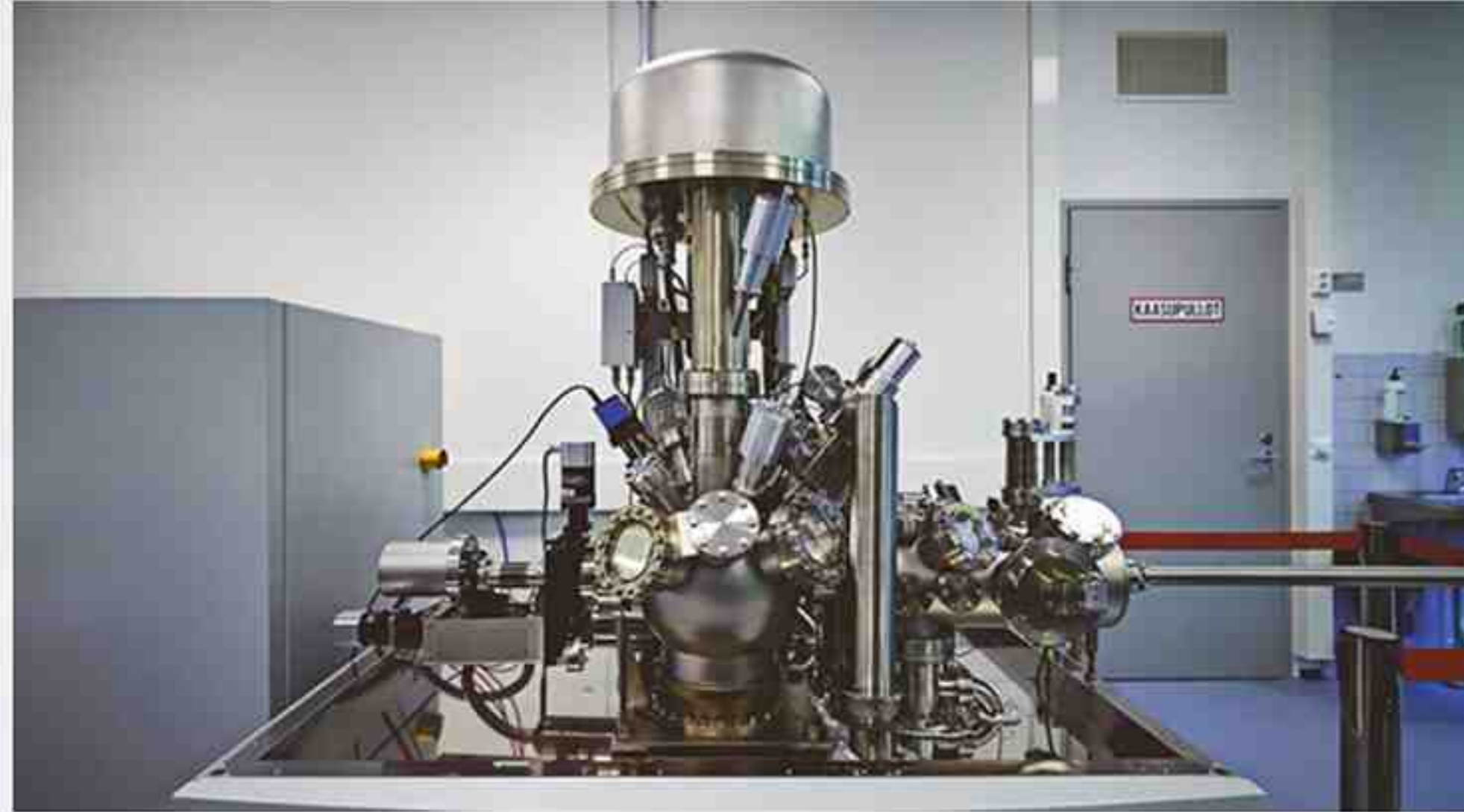




# X-RAY



## 1. X-ray Source:

- X-ray devices typically feature an X-ray tube as the source of X-rays. Inside the tube, electrons are accelerated to high speeds and then suddenly decelerated or stopped, producing X-rays.

- This process occurs through interactions between electrons and a target material, usually a heavy metal like tungsten.

## 2. X-ray Beam Formation:

- The X-ray tube emits a broad spectrum of X-rays, which are then filtered to select the desired energy range for a particular application.

- Collimators and other components shape and direct the X-ray beam towards the target of interest.

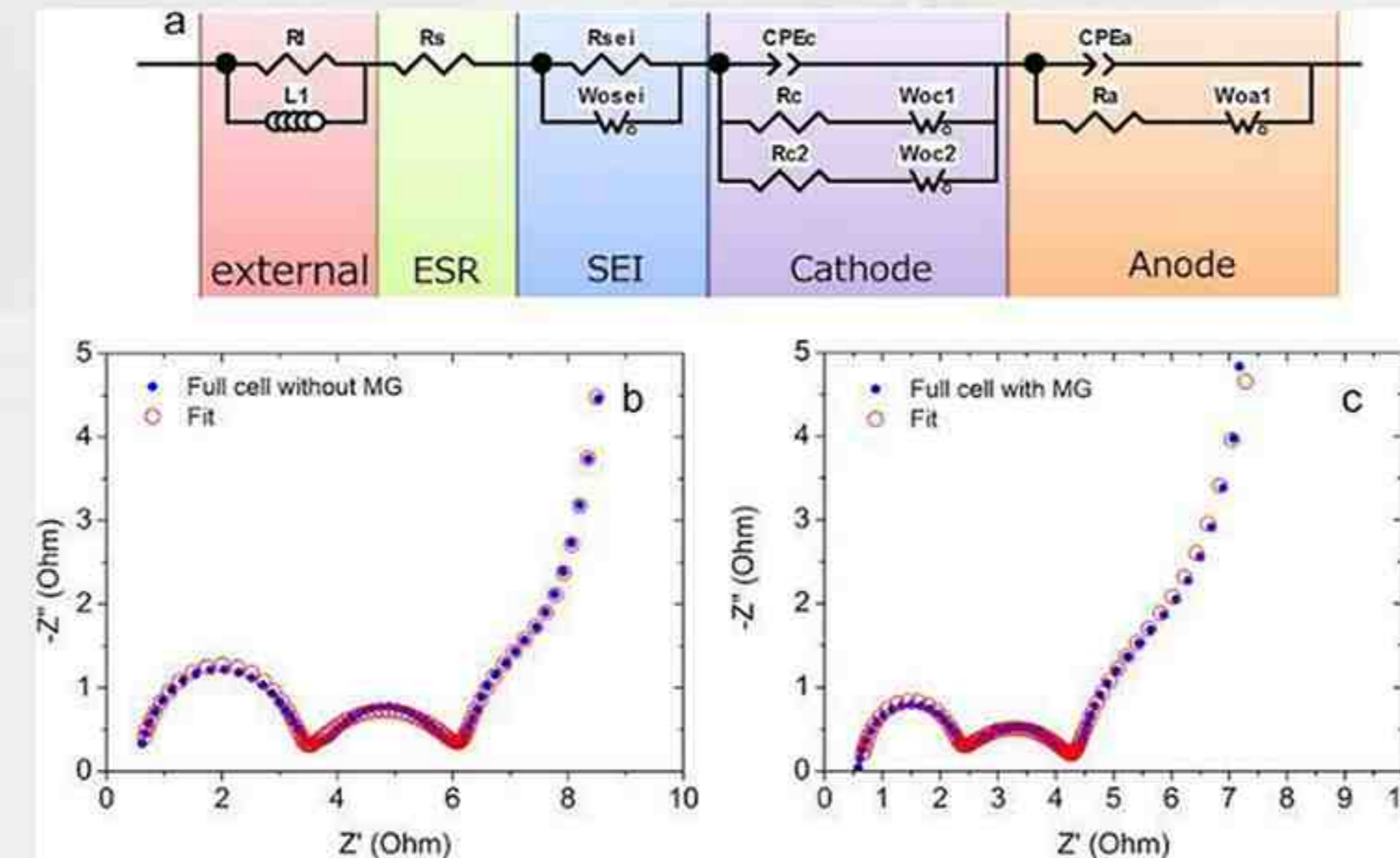
## 3. Interaction with Sample:

- The X-ray beam interacts with the sample being studied. The sample may absorb or scatter X-rays depending on its composition and structure.

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# EIS



**In analytical chemistry:** EIS stands for Electrochemical Impedance Spectroscopy. It's a powerful technique used to study the electrochemical properties of materials, surfaces, and interfaces. EIS measures the impedance response of a system to an applied sinusoidal voltage over a range of frequencies, providing valuable information about processes like corrosion, adsorption, and reactions occurring at the electrode interface.

1. Principle: EIS works by applying a small amplitude AC voltage across an electrochemical cell and measuring the resulting current response. By varying the frequency of the applied voltage over a wide range, EIS can probe different electrochemical processes occurring at the interface.

2. Components: The basic setup includes a potentiostat / galvanostat to apply the voltage and control the current, a frequency response analyzer to measure the impedance, and electrodes immersed in an electrolyte solution.

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# TEM



## What is a TEM?

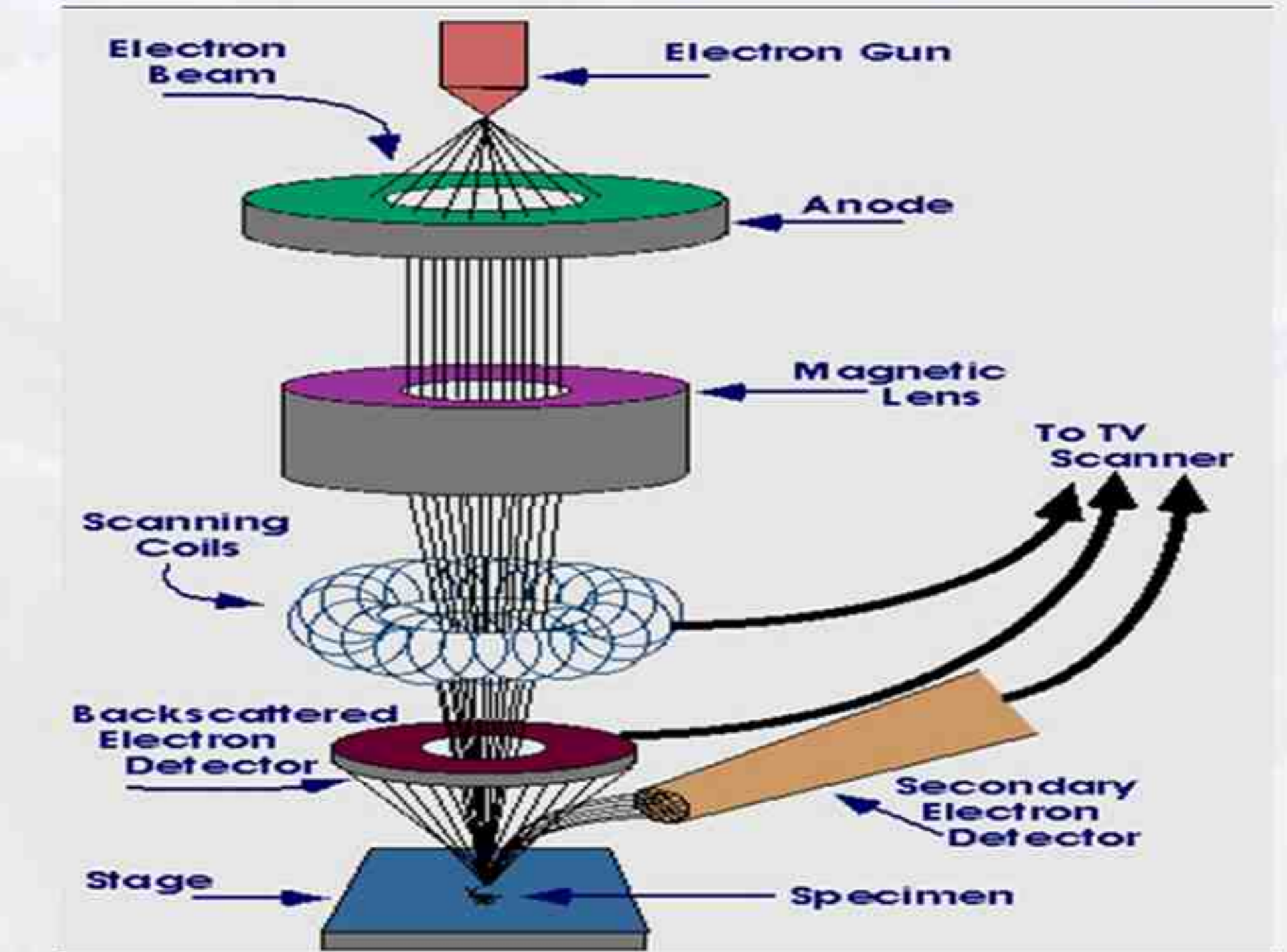
Transmission electron microscopy TEM is a microscopy technique in which a beam of electrons is transmitted through a specimen to form an image.

**TEM is the original form of electron microscope uses :**

- A high voltage electron beam to create a two-dimensional (2D) image.
- These electrons are emitted by an electron gun, accelerated by an anode, and focused by electromagnetic lenses.
- And finally transmitted through the specimen.
- When it emerges from the specimen, the electron beam carries information about the internal structures of the specimen.
- Fixed dehydrated specimens are embedded in resin, stained with heavy metals such as uranium and lead, and inserted into the electron column in the microscope.

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# SEM



## What is SEM?

Scanning electron microscopy or, SEM, is an advanced electron microscope that uses a focused beam of electrons to scan the surface of a sample. This technique differs from traditional microscopy by using electrons instead of light, enabling much higher resolutions.

**The SEM is an instrument that produces :**

- A highly magnified image by using electrons instead of light to form an image.
- A beam of electrons is produced at the top of the microscope by an electron gun.
- The electron beam follows a vertical path through the microscope, which is held within a vacuum.

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