Electron microscope

Diagnosis

Looking out for artefacts of fixation

- Micelles and strange-shaped mitochondria are examples of artefacts – structures that are seen under the microscope but aren't found in living cells. It's very important to be aware that artefacts can be introduced during fixation so that you don't mistake them for real parts of your sample. Telling the difference between an artefact and a 'real' structure can be difficult.

Looking out for artefacts of fixation

- To minimise the introduction of artefacts, scientists are continually experimenting with new ways to prepare samples. One approach is to freeze the sample very quickly instead of fixing it. Providing the sample stays cold enough, this 'locks up' the water and prevents it from evaporating inside the microscope. Freezing samples is common in SEM (and is known as cryoSEM).
- It is still in the early stages of development for TEM.

Sample preparation in TEM and SEM: the differences

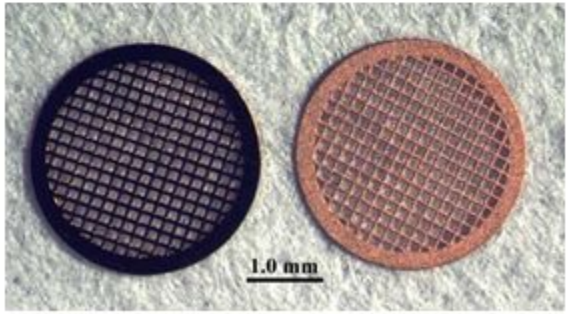
- Fixation and dehydration are important for preparing samples for both the TEM and the SEM.
- However, other aspects of sample preparation differ greatly because the two microscopes have different requirements.

SEM SAMPLE PREPARATION

1. Cleaning the surface of the specimen
2. Stabilizing the specimen
3. Rinsing the specimen
4. Dehydrating the specimen
5. Drying the specimen
6. Mounting the specimen
7. Coating the specimen

SAMPLE PREPARATION FOR TEM

- **Fixation** - fixed with chemical products (e.g. glutaraldehyde)
- **Rinsing and 'staining'** - treated with heavy metal compounds.
- **Dehydration** - washing with increasing ethanol concentration, followed by final wash in another a polar substance like propylene oxide.
- **Embedding in resin** - material is gradually infiltrated with the still unpolymerized resin .Little pieces of resin-infiltrated material are placed in small holders.
- **Trimming of resin block and ultrathin sectioning** - sections with a thickness of about 70 nm are cut with special knifes of cleaved glass . The cutting is done with a ultra-microtome.
- **Collection of sections on grid**



Advantages for TEM

- TEMs offer the most powerful magnification, potentially over one million times or more
- TEMs provide information on element and compound structure
- Images are high-quality and detailed
- TEMs are able to yield information of surface features, shape, size and structure
- They are easy to operate with proper training

DISADVANTAGES FOR TEM

- Spherical Aberration.
- High Voltage can damage Sample.
- Sample should be xtremely thin upto 100 nm.
- Bio Samples are Dehydrated , chemically fixed, embedded in polymer resin to stabilize them.
- Staining is required to highlight in order to achieve require image contrast.
- Thinning of sample should be done upto 100 nm

- Electron microscopes are valuable tools in medical and biological fields, as well as for materials research.
- scientists uses an electron microscope for their research. scientist cannot conduct their work without the use of an electron microscope at their lab.
- INTERPRETATION OF EM DATA
- USED FOR VIRUS DETECTION
- Used to examine cells, microorganisms, metals, crystals and biopsy samples