Electron microscopy
Lecture
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Electron microscopy = EM
Transmission EM = TEM
Surface Scanning EM = SEM

Principals

X-ray spectrum

TEM
TEM sample preparation

Fixation
Glutaraldehyde
Paraformaldehyde

Buffers
Potassium phosphate
Cacodylate
\( \text{C}_2\text{H}_6\text{AsO}_2\text{Na} \)

Post-fixation
Osmium

Dehydration
Alcohol series

Embedding
Epon
LR White

Cutting
100nm sections

Staining
Lead citrate
Uranyl acetate

Cutting
100nm sections

Organelles

TEM

Actin

TEM

Microtubules
TEM

Tissue: cellular
extracellular

Cell-cell contacts

Bacteria
Extracellular matrix

Expression of virus

TEM sample preparation

Fixation
Glutaraldehyde
Paraformaldehyde

Buffers
Potassium phosphate
Cacodylate
(C₄H₅AsO₂Na)

Post-fixation
Osmium
Tannic acid
SEM sample preparation

The phase diagram shows the pressure to temperature ranges where solid, liquid and vapour exist. The boundaries between the phases meet at a point on the phase diagram called the triple point. Along the boundary between the liquid and vapour phases is possible to choose a particular temperature, and corresponding pressures, where liquid and vapour can co-exist and hence have the same density. This is the critical temperature and pressure.

Critical point drying
Water
Alcohol or acetone series
Liquid CO₂

SEM sample preparation

Sputter coating
10nm Gold
Conductivity
High contrast

SEM

Surfaces of larger objects e.g. Insects
**SEM**

**Single cells**

**SEM**

**Cell-cell interaction**

**SEM**

**Secondary Ion Mass Spectroscopy = NanoSIMS**

- bombardment of a sample with an energetic primary ion beam
- displacement of ions from the sample
- secondary ions
- isotopic information of the sample surface

**Energy-Filtering TEM = EFTEM**

Electron Energy-Loss Spectroscopy = EELS

- Element analysis
- Single atoms
- Oxidation state