3.18 Specimen preparation

Unfortunately, there is no one universally applicable specimen preparation technique, since the preparation method varies according to the type and nature of the specimen being examined.

The following, however, lists certain basic requirements, etc. common to all specimens. For specific details regarding the various preparation techniques, refer to the bibliographies given in books dealing with the subject of scanning electron microscopy.

1. Common basic requirements for all specimens
   1. The specimen must be shaped so as to fit the specimen holder and must be secured firmly in the specimen holder.
   2. The specimen must be conductive. Therefore, non-conductive specimens require coating with a conductive agent.
   3. Since the specimen is examined in vacuo and is subject to electron beam bombardment, the specimen must be appropriately treated before being introduced into the microscope. Otherwise, satisfactory micrographs cannot be obtained. Moreover, the microscope will be contaminated by the specimen itself or gases evolving from the specimen.

   Note: The following specimens must be handled with great care:
   Volatile specimens
   Radioactive specimens
   Wet specimens; that is, thick plant leaves, bulky soft animal tissues, etc.
   Fine particles
   Magnetic materials
   Porous specimens (especially gas-absorbed specimens).
2. Securing the specimen
   Use conductive paint to secure the specimen to the specimen stub.
   Note: In addition to conductive paint, double-sided adhesive tape, vacuum compound, methyl cellulose solution, manicuring solution and various other adhesives can also be used for securing the specimen to the stub.
3. Specimen coating
   In the case of non-conductive specimens, coat the specimens by vacuum evaporation or sputtering in order to avoid any buildup of surface charge and reduce damage by thermal effects of the electron beam and further to improve the secondary electron yield ratio.
   - Vacuum evaporation
     Coating materials: Carbon (continuous; not in aggregate form; uniform; highly adhesive),
     Gold (non-oxidization; extremely fine particles; low melting point; high secondary electron emission),
     Platinum-palladium alloy, aluminum, etc.
     Coating thickness: 10 ∿ 20 nm
     The double coating method (e.g., one thin coat of carbon topped by one coating of gold) is widely used for various specimens.

- Sputtering Materials: Gold, Platinum-Palladium alloy, chromium, silver, copper, etc.