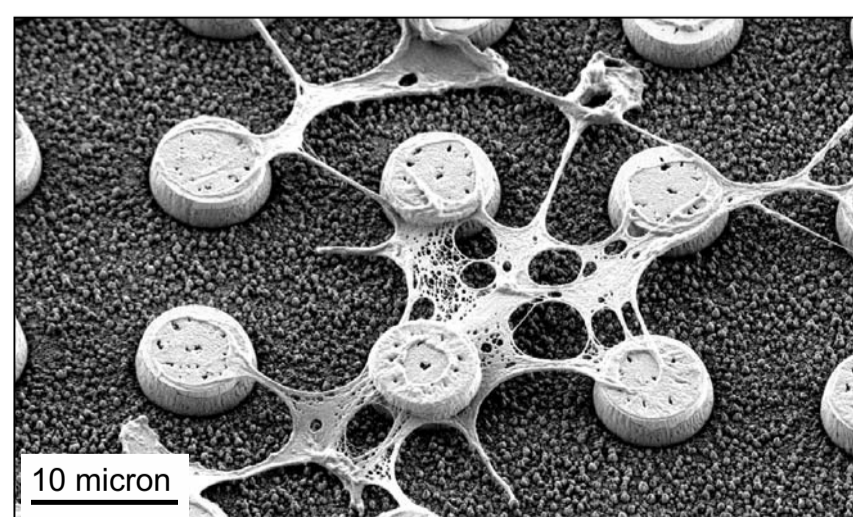


Scanning Electron Microscopy (SEM)

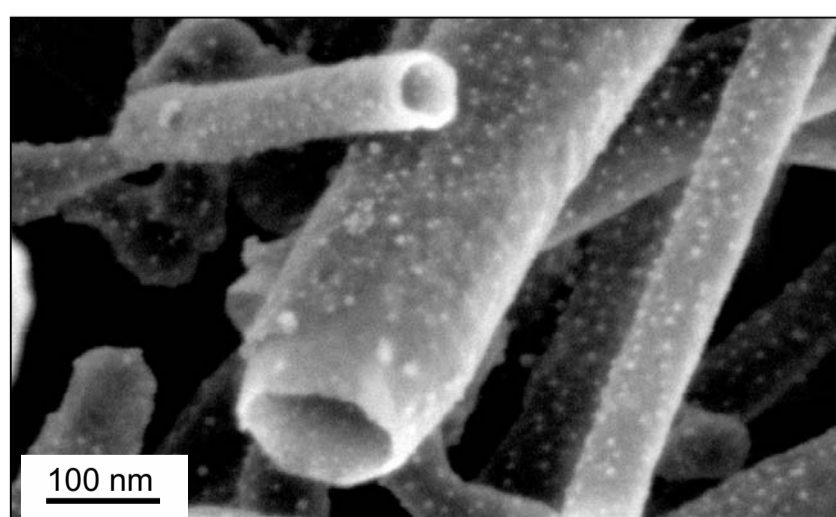


A scanning electron microscope (SEM) is a type of electron microscope that produces images of a sample by scanning it with a focused beam of electrons. The electrons interact with electrons in the sample, producing various signals that can be detected and that contain information about the sample's surface topography and composition. The electron beam is generally scanned in a raster-like pattern, and the beam's position is combined with the detected signal to produce an image. SEM can achieve resolution better than one nanometer. Specimens can be observed in high vacuum, low vacuum, and also under near-ambient conditions. In an environmental SEM, for example, specimens can be observed in wet conditions.

Application: SEM is used to explore the surface morphology of a material. All materials can be studied, - except in the liquid or gaseous state -, from metals up to biological specimens. It is also possible to analyse the chemical composition of the sample by collecting and analysing X-ray photons.

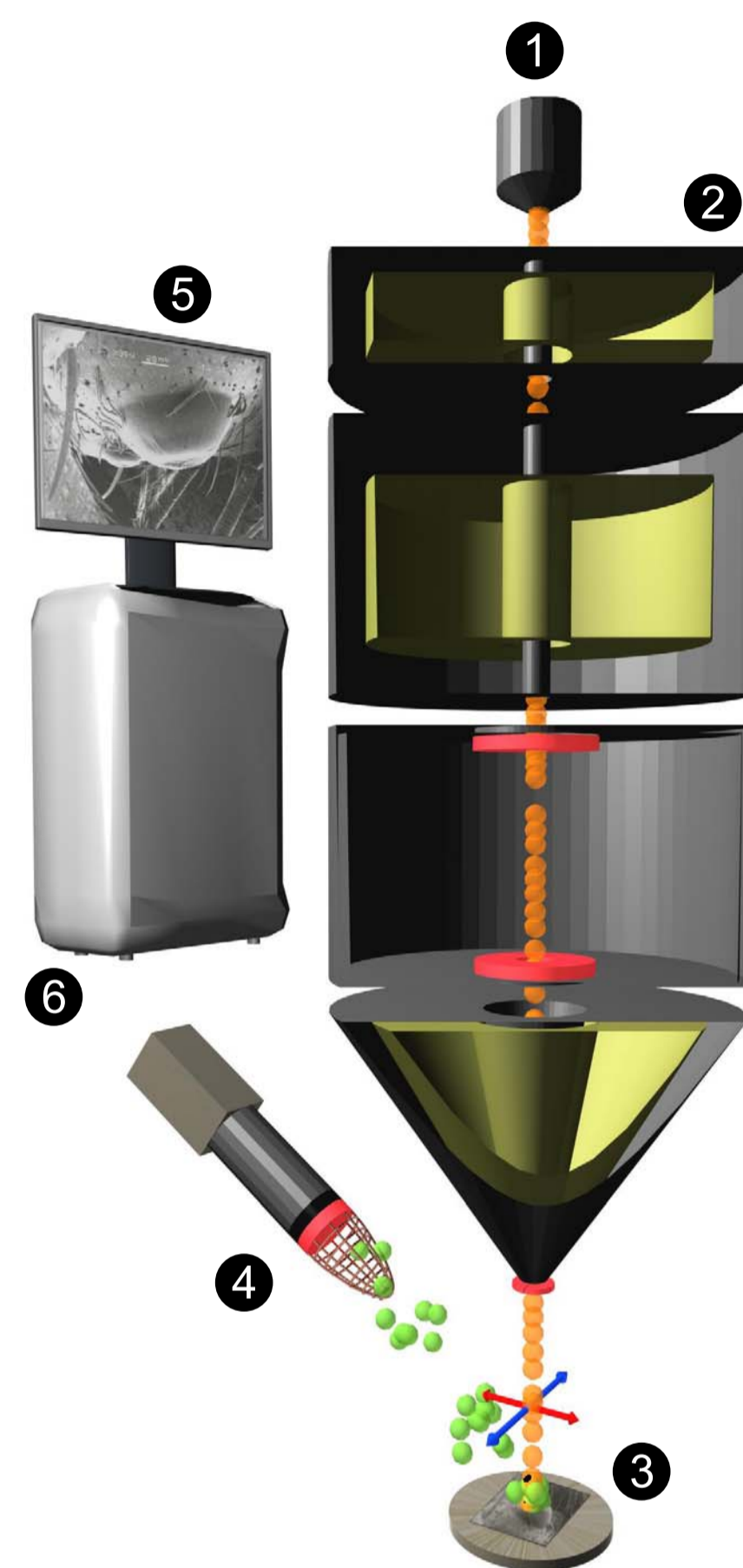


Secondary electron image showing the surface of an etched silicon device coated with a layer of photoresist



Secondary electron image showing finely dispersed Pt nanoparticles on Carbon nanotubes

Schematic overview



1. An electron gun creates a small beam of electrons
2. Electron lens system, for focusing and scanning the electron beam onto the specimen
3. A nanometer sized spot of electrons with high energy generates secondary electrons, backscattered electrons and X-rays
4. Detector for secondary electrons, backscattered electrons or X-rays
5. Processed image of the specimen
6. Control computer