

3D Atom Probe Tomography (APT)



Atom Probe Tomography allows the three-dimensional imaging of a tip-shaped specimen atom by atom. Additionally APT enables to determine the chemical composition on the atomic scale in an arbitrary analysis volume within the imaged sample volume. Typical APT specimens are sharp needles, which have to have apex diameters of about 100 nm or less, so that the surface atoms may get evaporated under a static high voltage (HV = 5-20 kV) and an additionally applied high-frequency HV or laser pulse. The time resolved and position sensitive detector analyses the type of the evaporated ions by Time-of-Flight mass spectroscopy. Combining the detector information the specimen can be reconstructed three dimensionally with almost atomic resolution. Fields of applications include e.g. metals and semiconductors.

Contact

See KNMF website or contact the KNMF User Office.

Features

- APT type: LEAP 4000X HR
- FOV: up to 250nm

Voltage Atom Probe

- High Voltage: up to 20 kV
- Pulse frequency: up to 200 kHz

Laser Atom Probe

- Laser Wavelength: 355 nm
- Spot size: < 3 μm
- Pulsing frequencies: up to 250 kHz

Available preparation techniques

- FIB
- Electro Polishing (only conductive materials)

Limitations/constraints

- Spatial resolution (depth): 0.1 - 0.3 nm
- Spatial resolution (lateral): 0.3 - 0.5 nm
- Specimen dimensions:
sharp needles: length a few μm ,
tip apex: < 100 nm.

Materials

Metal, Semiconductors, Silicon