Owari Laboratory

[Design of Three Dimensional Atom Probe(3DAP)]
[Three-dimensional microanalysis using micro-beam and nano-beam SIMS]

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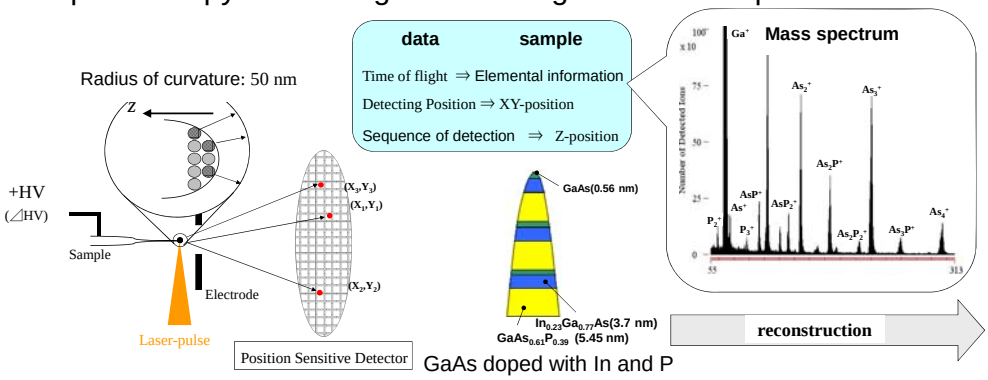
http://www.owari.esc.u-tokyo.ac.jp/

Research topic ● micro and nano material analytical chemistry

Department of Applied Chemistry

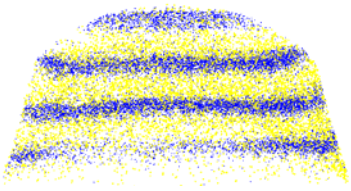
Design of Three Dimensional Atom Probe(3DAP) Be-B05

Atom probe tomography enables the quantitative chemical analysis of nanostructured materials with a nearly atomic scale. By carefully controlled field evaporation, individual atom is removed from a tip-shaped sample and its time of flight and detected position are determined. The atoms are identified by mass spectroscopy and their geometric origin within the specimen is also reconstructed.



Schematic image of 3DAP

GaAs doped with In and P



Atomic level 3D-image

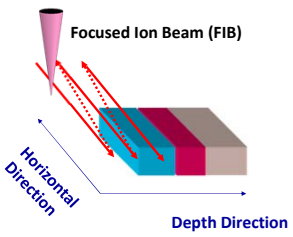
Blue : In Yellow : P

Three-dimensional microanalysis using micro-beam and nano-beam SIMS Fe-408

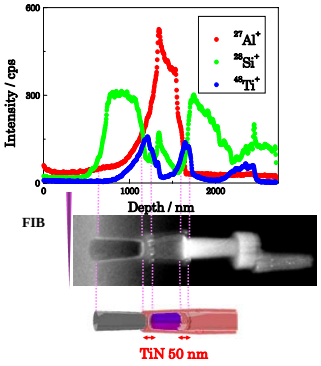
Secondary Ion Mass Spectrometry(SIMS) is analysis method that analyze secondary ions yielded from samples by irradiating accelerated primary ion beam.

◆nano-beam SIMS

Shave-off depth profile can be acquired directly by the fast horizontal sweep of FIB combined with the very slow vertical sweep.



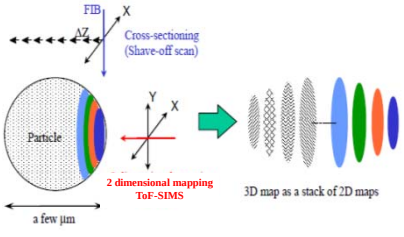
. Schematic image of shave-off scan



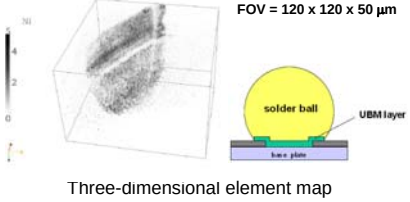
Acquired shave-off depth profile

◆Dual FIB ToF-SIMS

Three-dimensional image can be obtained by operating two FIB alternately. One FIB is for section processing by shave-off scan, the other is for ToF-SIMS mapping.



Dual FIB ToF-SIMS basic concept



Three-dimensional element map of UBM layer in solder bump ($^{58}Ni^+$)