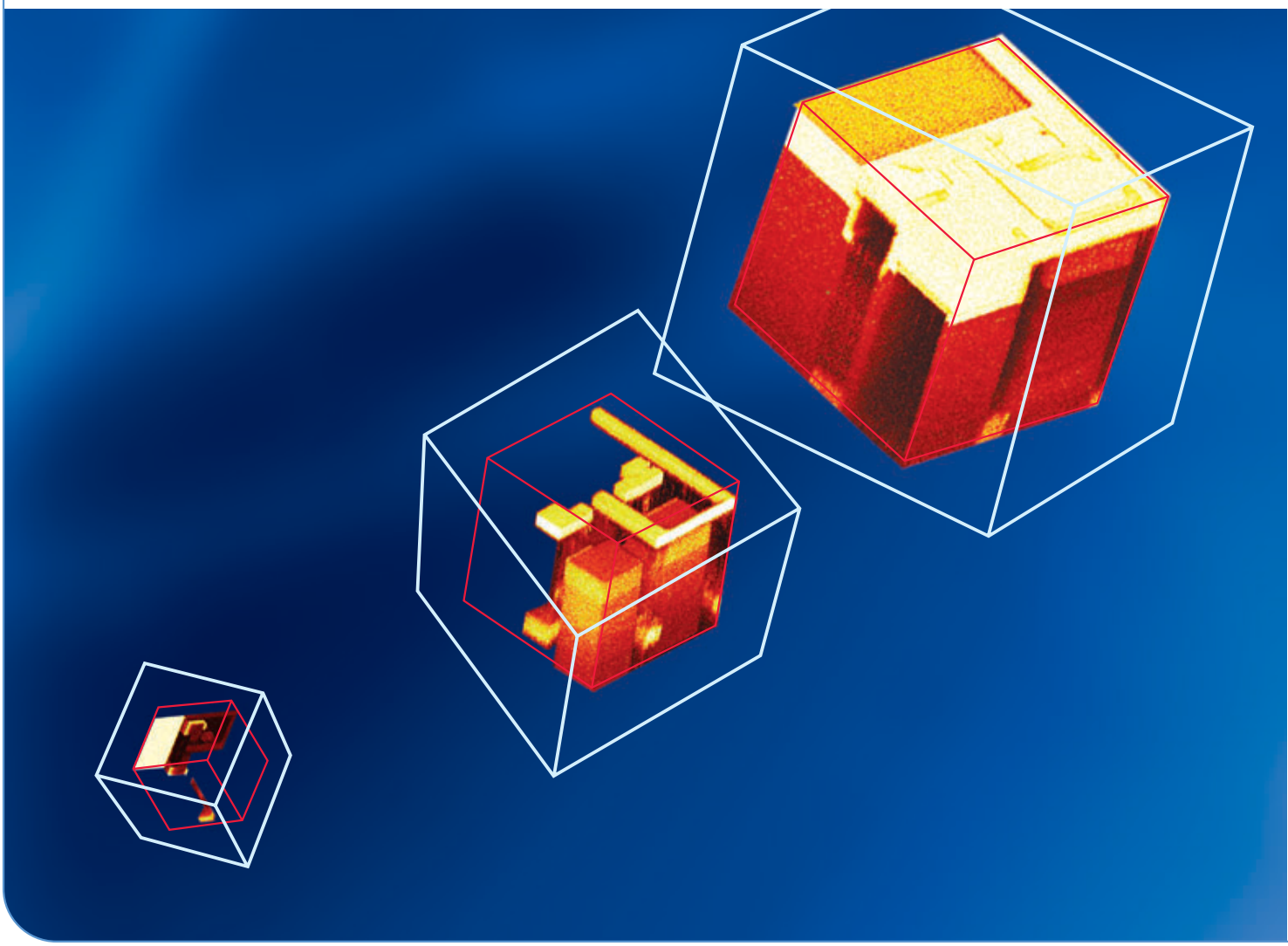
TECHNICAL NOTE | 3D Analysis



Get the full picture

The TOF.SIMS 5 has several features which when combined provide powerful means of three dimensional analysis of sample volumes.

- **High spatial resolution imaging**
- **Dual beam depth profiling for independent optimisation of sputter and analysis beams**
- **Parallel detection of all secondary ions generated**
- **Storage of the complete mass spectrum at every analysis point with position coordinates.**
- **Software for manipulating stored data making 3D imaging and analysis a practical technique.**

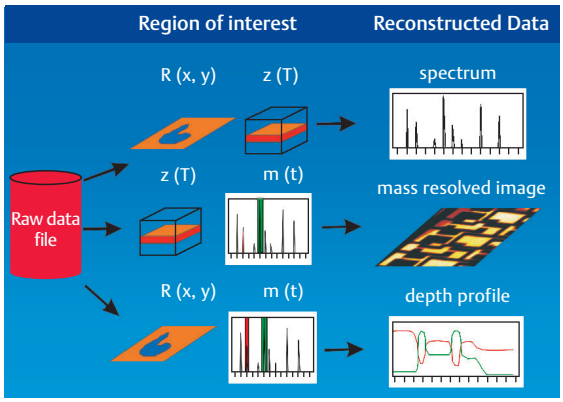
The full 3D analysis capability is of particular importance for samples where the lateral as well as in-depth distribution is irregular (e.g particles, grain boundaries, etc).

TOF.SIMS 5

Data Acquisition

By digitally scanning the primary ion analysis beam, high spatial resolution ion images of all secondary ions from the sample surface are produced. By sputtering the sample surface simultaneously images from increasing depth are obtained and hence three dimensional data are collected.
The raw data file contains each point of analysis of the digitally scanned beam with its X, Y, and Z coordinates and a mass spectrum, and the TOF.SIMS 5 software enables various analytical and visual reconstructions to be made.

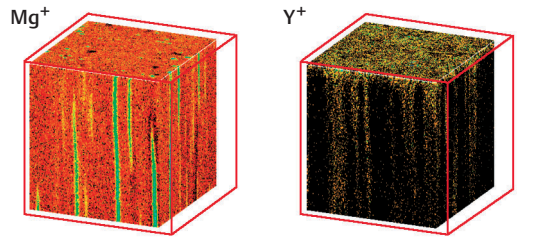
Raw Data Handling
Spectrum, Image and Depth Profi



Concept of retrospective analysis from the stored raw data file. Spectra, images, and depth profiles can be reconstructed from any area at any depth and from any ion.

Diffusion Experiment

Fig. 1



(Sample provided by Prof. Martin, RWTH Aachen, Germany)

Fig. 2

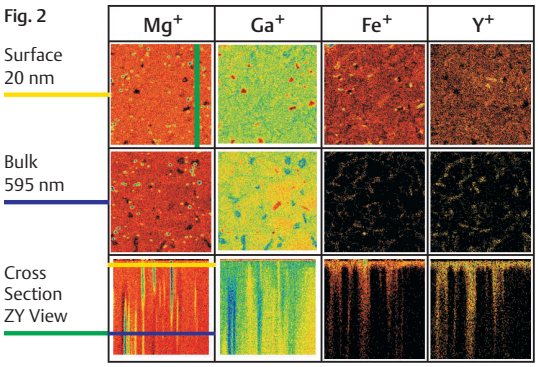
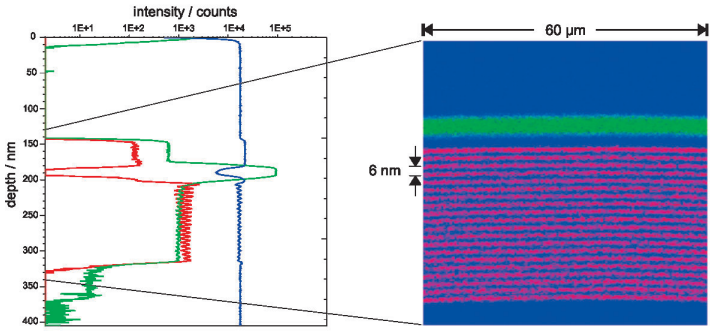


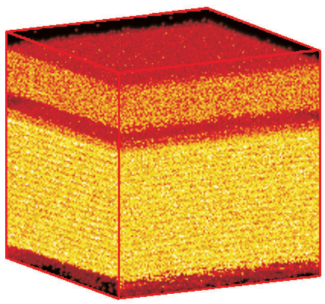
Fig. 1 3D image of Mg^+ (a matrix component of a poly-crystalline metal oxide composed of $O_{2.8}$ $Mg_{0.2}$ $Ga_{0.8}$ $S_{0.2}$ $La_{0.2}$) and Y^+ (an element the surface was covered with for diffusion experiments).

Fig. 2 Set of 2D images reconstructed from the same data set as above. First row: Surface images. Second row: Images at a depth of 595 nm. Third row: Cross section along the green line (given in the top left image)



Depth Profile red: Al_2 green: In blue: Ga_2 grey: GaAl

2D Vertical Section Overlay Image red: Al_2 green: In blue: Ga_2



3D Image Al+Al_2+GaAl

Example of reconstruction possibilities from raw data. The sample is a GaAs/AlGaAs superlattice. A volume of 60 x 60 μm^2 (surface area) x 400 nm (depth) was analysed. The 2D section and the 3D image are reconstructed from depths of 130 nm to 340 nm.

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