# NanoSIMS analysis of BMD in silicon wafer

The NanoSIMS 50L can provide the highest lateral resolution among secondary ion mass spectrometers and can simultaneously achieve high sensitivity and high mass resolution. Here, we introduce examples of measuring oxygen precipitates in silicon wafer.

1. NanoSIMS 50L

<Specifications>

Primary ion species	Cs$^+$ or O$^-$
Minimum beam size	O$^-$: < 50 nm Cs$^+$: < 50 nm
Detection limit	ppb – ppm
Mass spectrometer	Double focusing magnetic sector
Number of ion detected	7
Measurement depth	< several 100 nm

2. What is BMD?

Si wafer

Oxygen precipitate defect free area (BMD free area)

Bulk layer
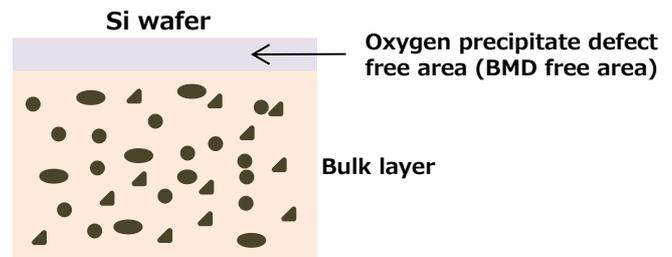
By the annealing treatment, an ideal Si wafer structure of "no defects on the surface layer and a gettering layer inside" is realized. Oxygen precipitates [BMD (bulk micro defects, oxygen precipitates)] play an important role as metal contamination gettering sites in the device process.

3. BMD images using D–SIMS or NanoSIMS 50L

BMD images using D-SIMS

There was a difference in oxygen concentration between the defect-free region and the bulk layer. Although inhomogeneous oxygen 2D image was obtained in the bulk layer, no clear distribution of BMD was detected in it.

BMD free area

Bulk layer

20μm

20μm
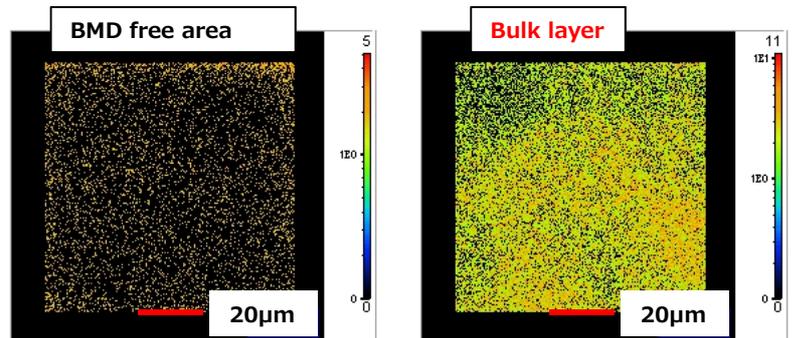
BMD images using NanoSIMS

Aligned Multiple BMDs were found in the bulk layer. In addition, a zoomed image allows us to visualize its distribution in the field of view in more detail.

Bulk layer

High

Oxygen precipitates

Zoom

2μm

High

Oxygen precipitate

0.5μm

Low

Low
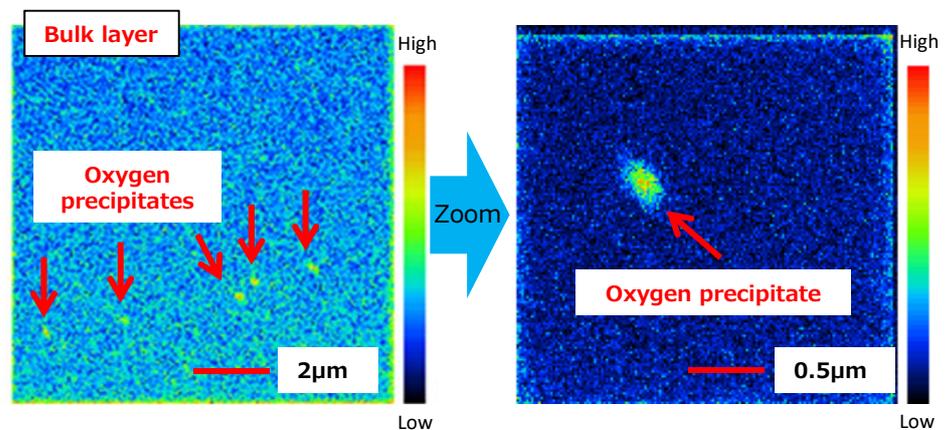
NanoSIMS 50L is useful tool for imaging analysis of light elements (H, C, N and O) in small area.

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