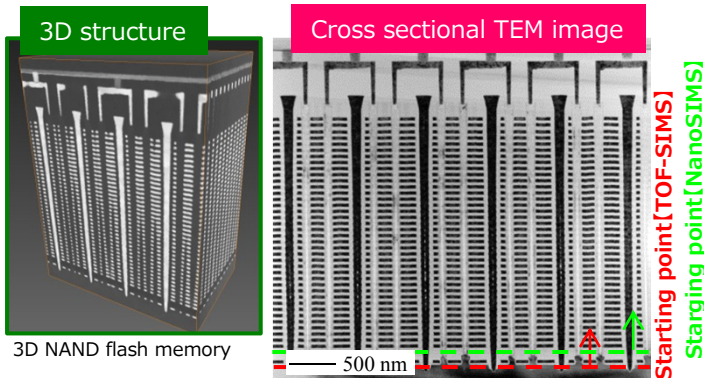


# NanoSIMS Analysis of 3D NAND Flash Memory

The NanoSIMS 50L can provide the highest lateral resolution among secondary ion mass spectrometry and can simultaneously achieve high detection sensitivity and high mass resolution. Here, we introduce examples of measuring 3D NAND flash memory using TOF-SIMS and NanoSIMS.

## Sample structure



## Instrumental features

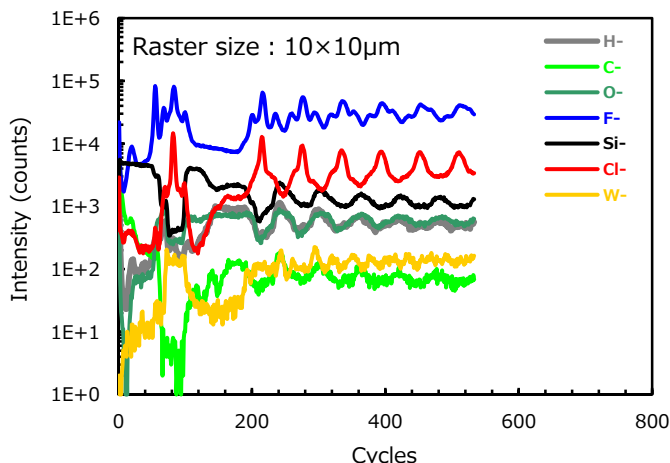
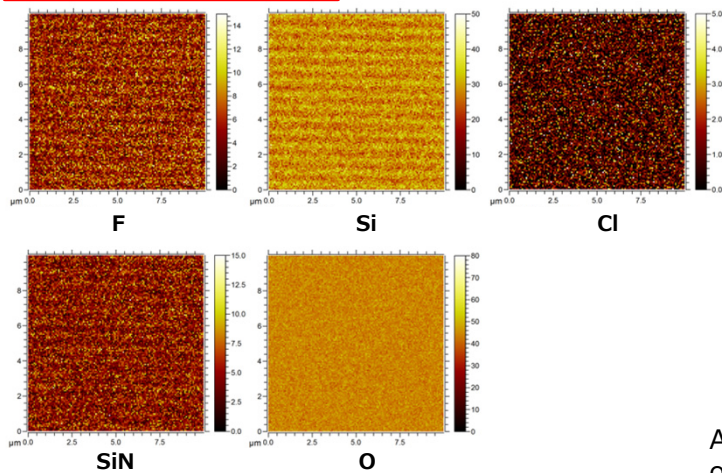
Instrument	TOF-SIMS (Depth)	NanoSIMS 50L
Analysis area	Several $\mu\text{m}$ - 300 $\mu\text{m}$ $\square$	Several $\mu\text{m}$ - 50 $\mu\text{m}$ $\square$
Lateral resolution	5 $\mu\text{m}$ (0.4 $\mu\text{m}$ *)	<b>50nm-</b>
Depth resolution	<b>1-5nm</b>	20nm
Analysis depth	Several nm- $\mu\text{m}$	Several 10nm- 1 $\mu\text{m}$
Detection limit	ppm	ppb-ppm
Mass resolution	$m/\Delta m = \sim 4000$ (300*)	<b><math>m/\Delta m = 4000 \sim</math></b>
Number of elements detected	All elements	7**

\*In the high lateral resolution mode of TOF-SIMS, mass resolution is about 300.  
\*\*In some cases, combination of elements might be restricted.

After thinning the Si substrate, SIMS analysis was performed from the backside to the front-side surface

## TOF-SIMS analysis results

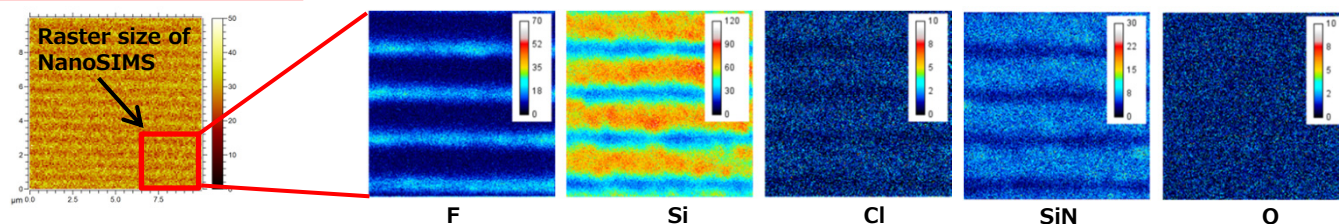
Raster size: 10 $\times$ 10 $\mu\text{m}$



A feature of TOF-SIMS is simultaneous measurement of all elements (qualitative analysis). As a result of the qualitative analysis, fluorine and chlorine were detected as characteristic elements.

## NanoSIMS analysis results

Raster size: 3 $\times$ 3 $\mu\text{m}$



Secondary ion images are obtained at higher lateral resolution and sensitivity in a small area compared with TOF-SIMS analysis.

**When analyzing a small area, it is important to use TOF-SIMS and NanoSIMS properly according to the purpose.**