

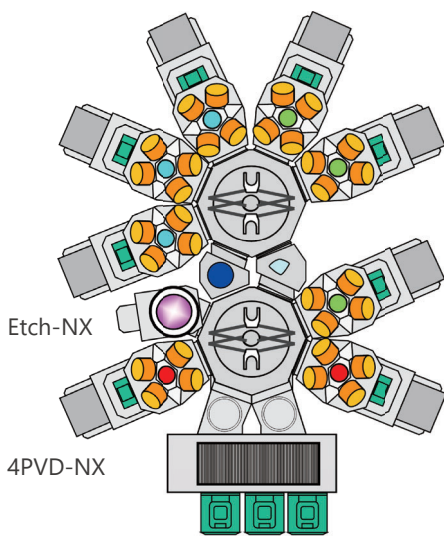
MTJ Sputtering Equipment for Mass production

For MRAM, HDD Head, Magnetic sensor

High TMR

High Throughput

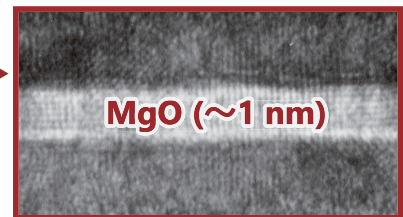
Good Uniformity



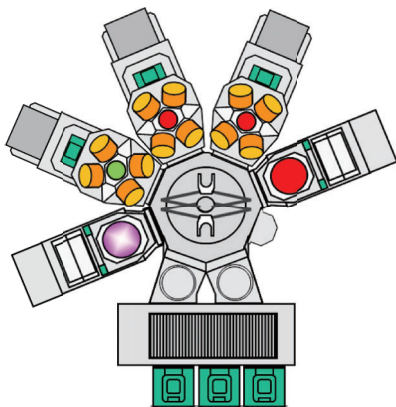
Example of system configuration1

TE
MgO (~ 1)
CoFeB (~ 1)
W (~ 0.5)
CoFeB (~ 2)
MgO (~ 1)
CoFeB (~ 1)
W (~ 0.5)
Co (~ 1)
Ru (~ 1)
Co (~ 0.2)/Pt (~ 0.2)
Ru (~ 5)
Pt (~ 5)
BE
Via

Example of pMTJ stack



TEM image of CoFeB/MgO/CoFeB



Example of system configuration for other NVM

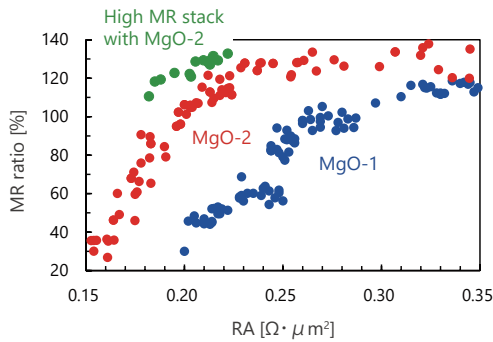
NC7900 for $\phi 200$ / $\phi 300$ mm



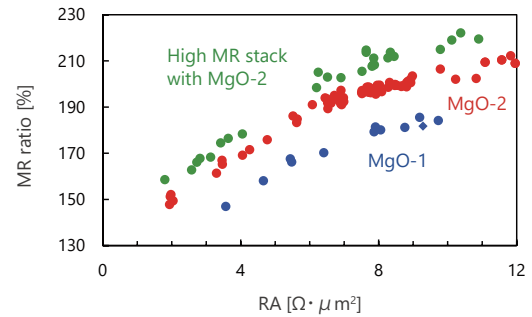
MTJ Sputtering Equipment for Mass production

For MRAM, HDD Head, Magnetic sensor

High TMR performance



iMTJ for HDD Head



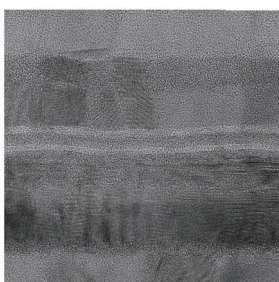
BP type pMTJ for STT-MRAM

Good uniformity

		RA [$\Omega \cdot \mu\text{m}^2$]	MR [%]
12 inch	Map 17 pts		
	Average	8.5	210
	Uniformity (\pm) [%]	0.9	1.5

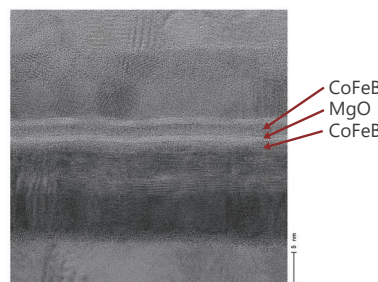
Unique technology

MgO film roughness: 11.7 [\AA]

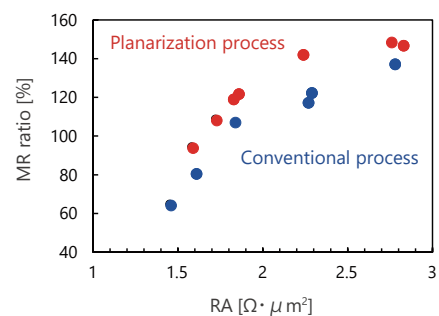


Conventional process

MgO film roughness: 9.1 [\AA]



Planarization process



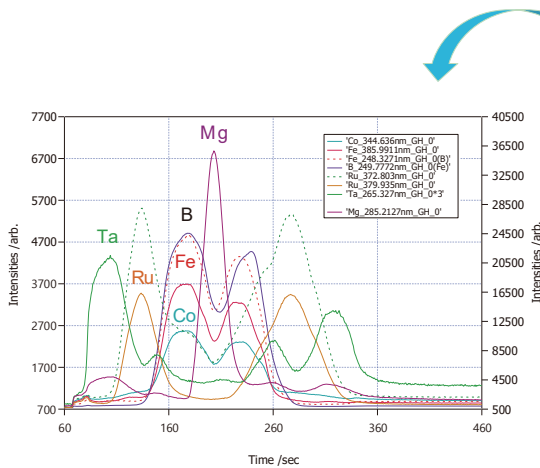
MTJ Etching Equipment for Mass production

For MRAM, HDD Head, Magnetic sensor

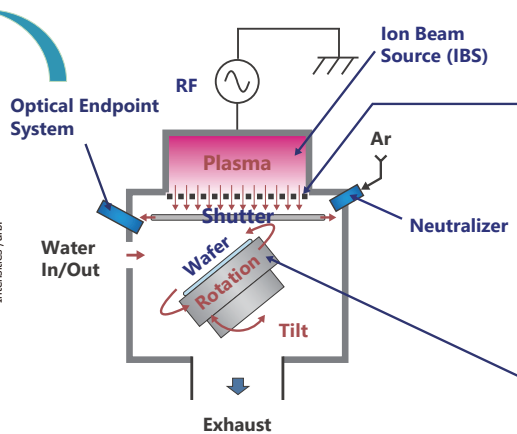
Good Repeatability

High Productivity

Excellent After-Etching Shape



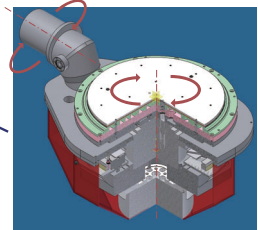
Optical Emission Spectroscopy



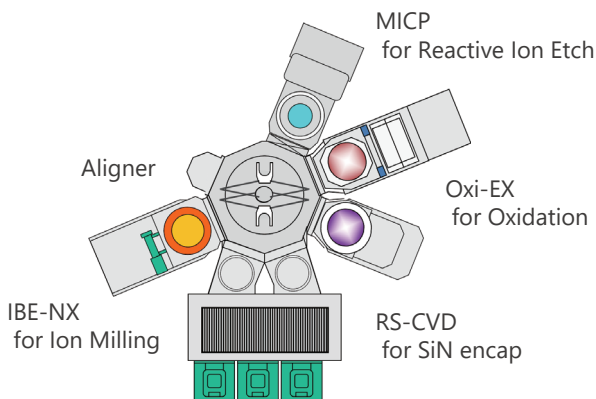
Schematics of IBE-NX module



Carbon grid



ESC rotating substrate (ERST) holder



Example of system configuration

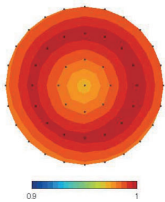
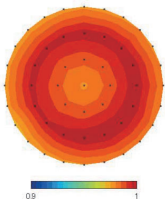
NC8000 for $\phi 200$ / $\phi 300$ mm

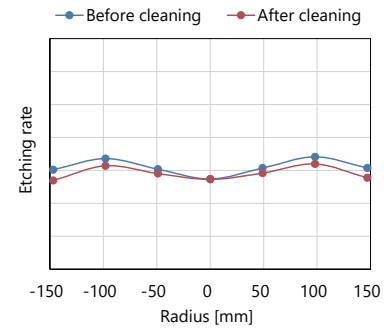


MTJ Etching Equipment for Mass production

For MRAM, HDD Head, Magnetic sensor

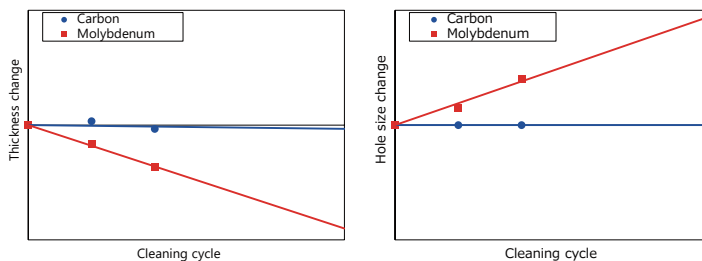
High TMR performance

		Before cleaning	After cleaning
12 inch	E.R. Map 49 pts		
	Etching rate [Å/s]	2.31	2.29
	Uniformity (±) [%]	1.4	1.4



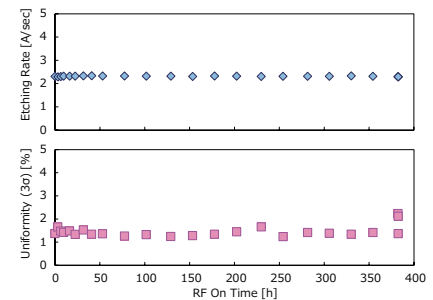
Same etching profile can be obtained without any adjustment

High robustness of carbon grid



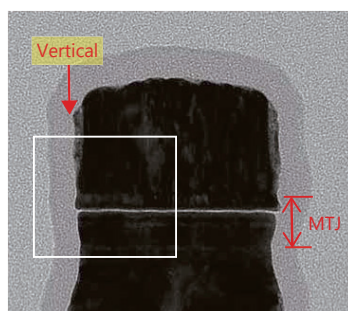
The erosion of carbon grids are much smaller than that of Mo

High process stability



Etch rate and WIW uniformity are stable until RF time of 350h

Excellent after-etching shape & residue-free surface on sidewall



Ar IBE

M. Ikeda (Canon ANELVA) et al.,
Presented at Intermag 2014, HQ-14
Courtesy of Avalanche Technology

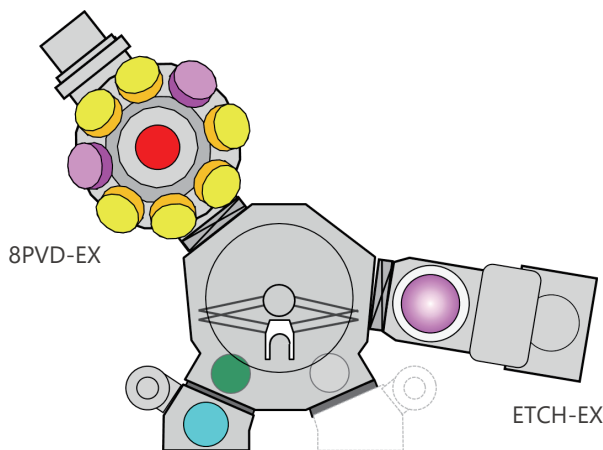
MTJ Sputtering Equipment for R&D

For MRAM, HDD Head, Magnetic sensor

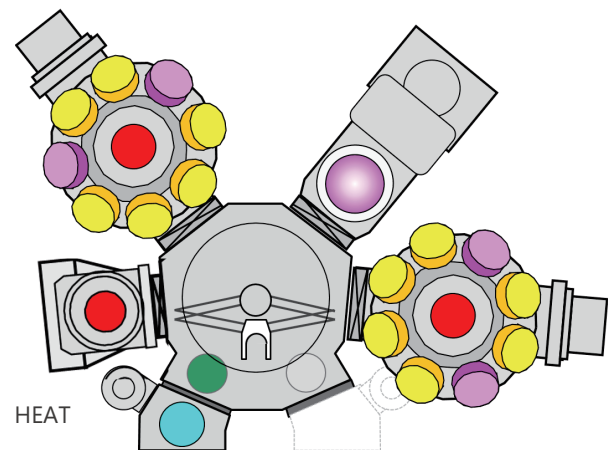
Small Footprint

Co-sputtering Availability

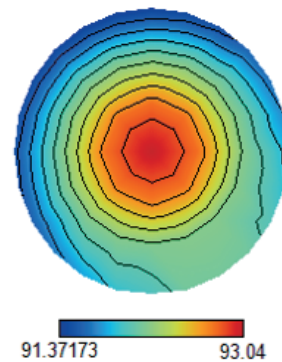
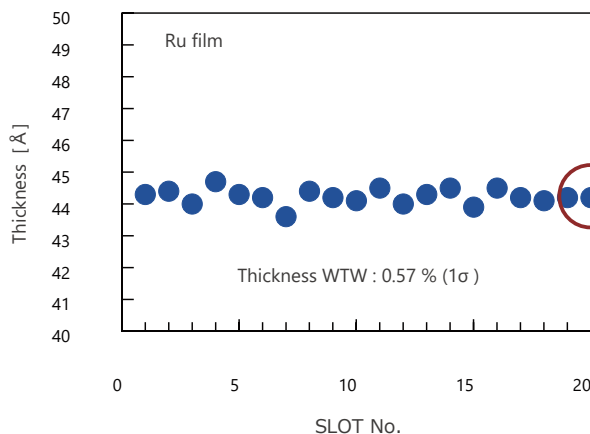
Good Film Quality



Example of system configuration1



Example of system configuration2



Single film property

Permanent Wafer Bonding at Room Temperature

Atomic Diffusion Bonding

Any Substrates Available

Various Bonding Materials

Ambient Control Sealing

● Substrates

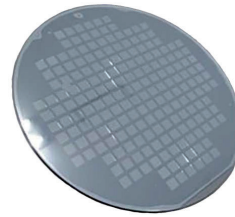


Si - Synthetic quartz

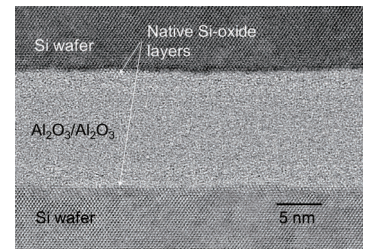


Synthetic quartz - Synthetic quartz

● Chip sealing



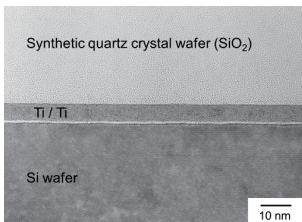
Patterned Silicon - Quartz



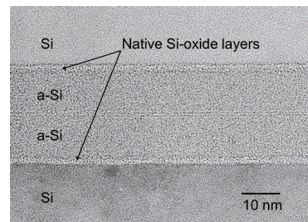
Silicon, Compound, Quartz, Glass or Others

● Bonding material examples

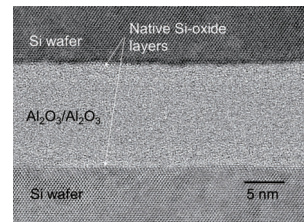
Titanium*



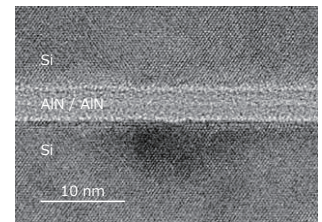
Silicon*



Aluminum Oxide*



Aluminum Nitride



* Courtesy of Shimatsu Laboratory, Tohoku University

BC7000 for ϕ 100 / ϕ 150 mm



BC7300 for ϕ 200 / ϕ 300 mm



Coming Soon !