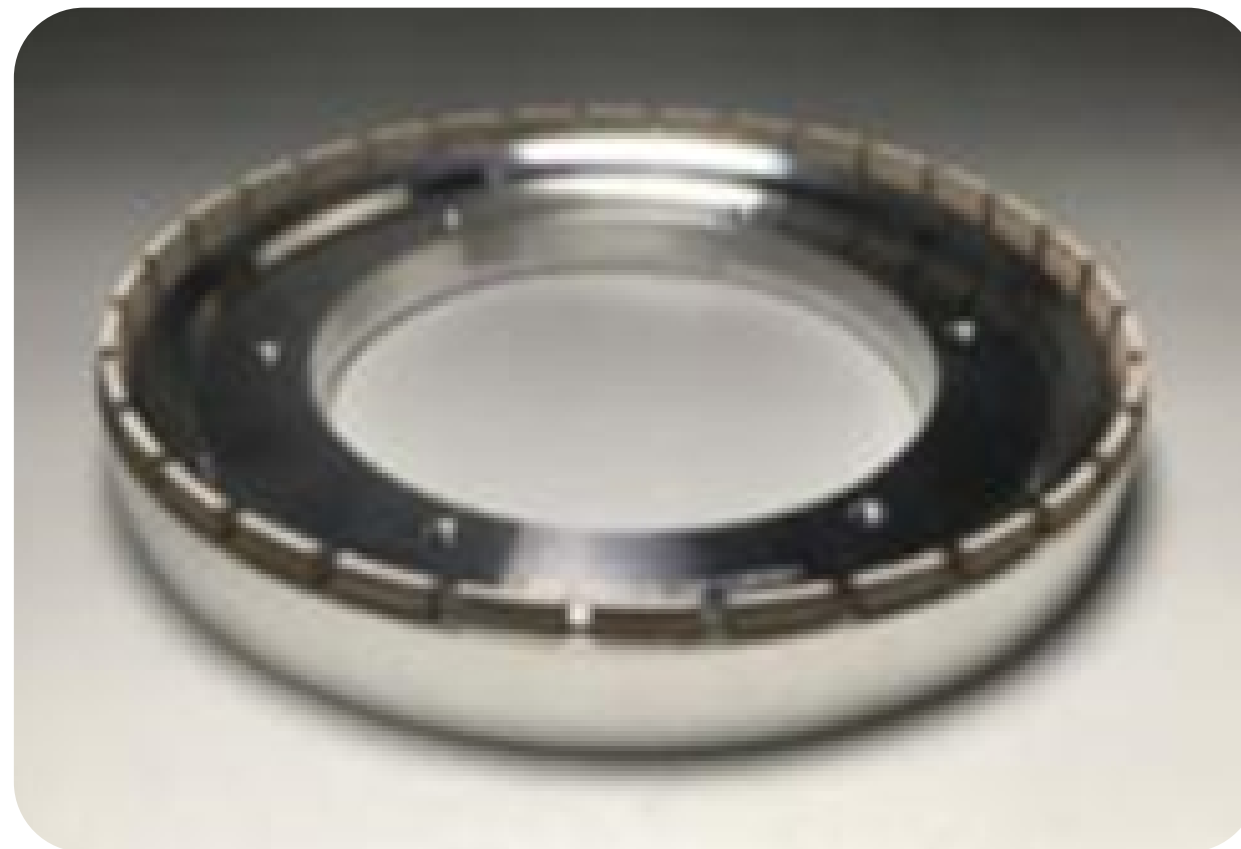




Proposal for WG/BG Grinding Wheels

High-Performance Grinding Solutions for SiC Wafers



Ver.1.2
2026/06/01

Strategic Development Division

Global Facilities and Product Portfolio

Since our founding, we have consistently delivered optimal solutions through fully customized manufacturing tailored to each customer's specific requirements.

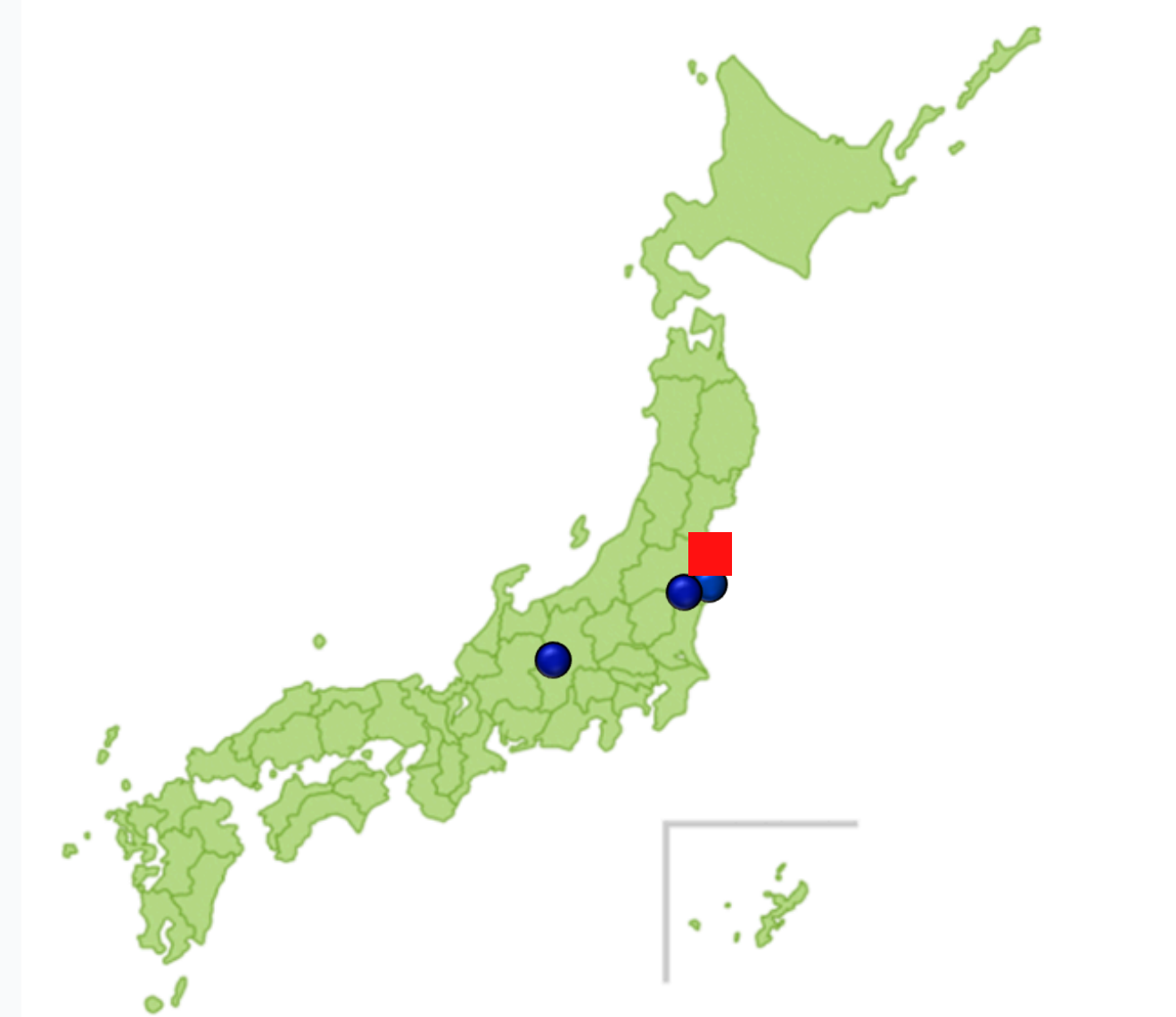
- ★Fully integrated manufacturing system from development to evaluation
- ★Dedicated WG/BG development center enabling rapid optimization

Global Facilities and Product Portfolio

-  **Natori Development Center**
Dedicated to WG/BG wheels – fully integrated development, manufacturing, and evaluation
-  **Sendai Plant**
Metal, Resin, Vitrified, and PCD products
-  **Nagano Plant**
MCD related tools
-  **Sendai Hinosaki Plant**
Electroplated products

Sales Office

Sendai, Tokyo, Nagoya, Osaka, Fukuoka



Product portfolio

- | | |
|--|--|
|  WG/BG |  Metal Products |
|  Resin products |  Vitrified products |
|  PCD products |  Electroplated products |



About NATORI Development Center

Specialized product development focused on WG/BG applications



- ✓ Fully in-house process from development through evaluation
- ✓ Supports wafers up to 8 inches

Target wafer MAX 8"

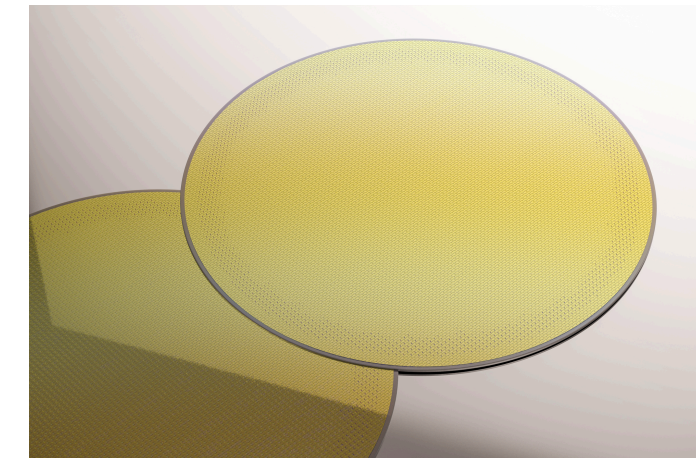
Compound material

SiC



LT/LN

★Focus on compound semiconductor materials



Processing Range

Rough to intermediate grinding: around #2000 grit

☉ Main around #2000

Achieves highly efficient stock removal with high throughput

Finishing process

☉ #7000~

Improves surface quality and dimensional/form accuracy



Features for “VEGA” WG/BG

■ High-quality development enabled by a fully in-house system

We provide a fully integrated solution—from raw material procurement through design, manufacturing, and performance evaluation—ensuring consistent quality and rapid development cycles.

■ Key Features

- High throughput capability
- Superior surface finish quality
- Excellent wear resistance and extended tool life
- Flexible design for diverse specifications
- Optimized specifically for hard and brittle materials such as SiC, enabling stable ductile-mode grinding.



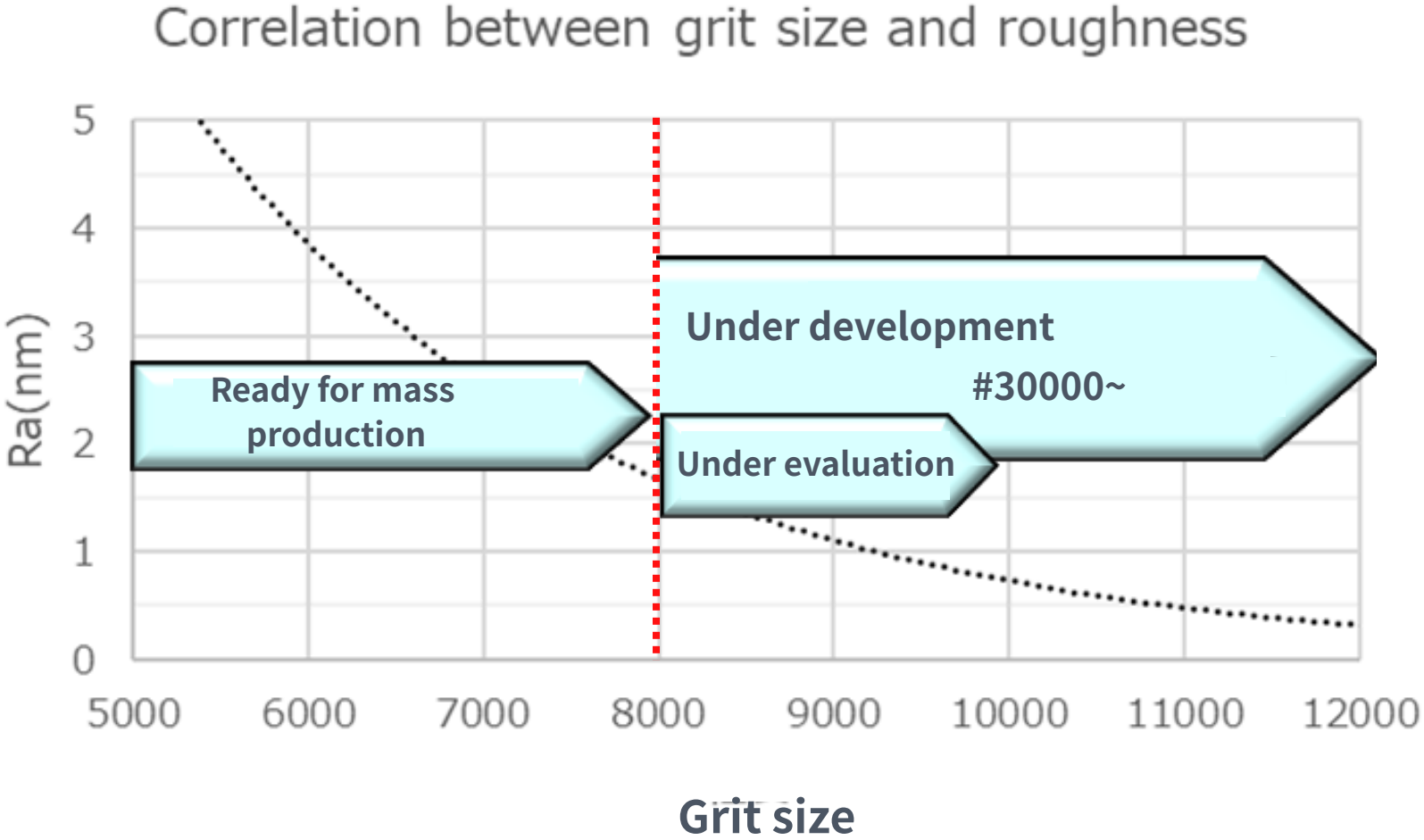
■ Overview of the new bonded grinding wheel “VEGA”

“VEGA” is a newly developed bonded grinding wheel specifically engineered for compound semiconductor wafer applications.

Feature

We offer highly flexible product design without conventional limitations, enabling optimization across grit size, tool geometry, and tool life based on your specific requirements.

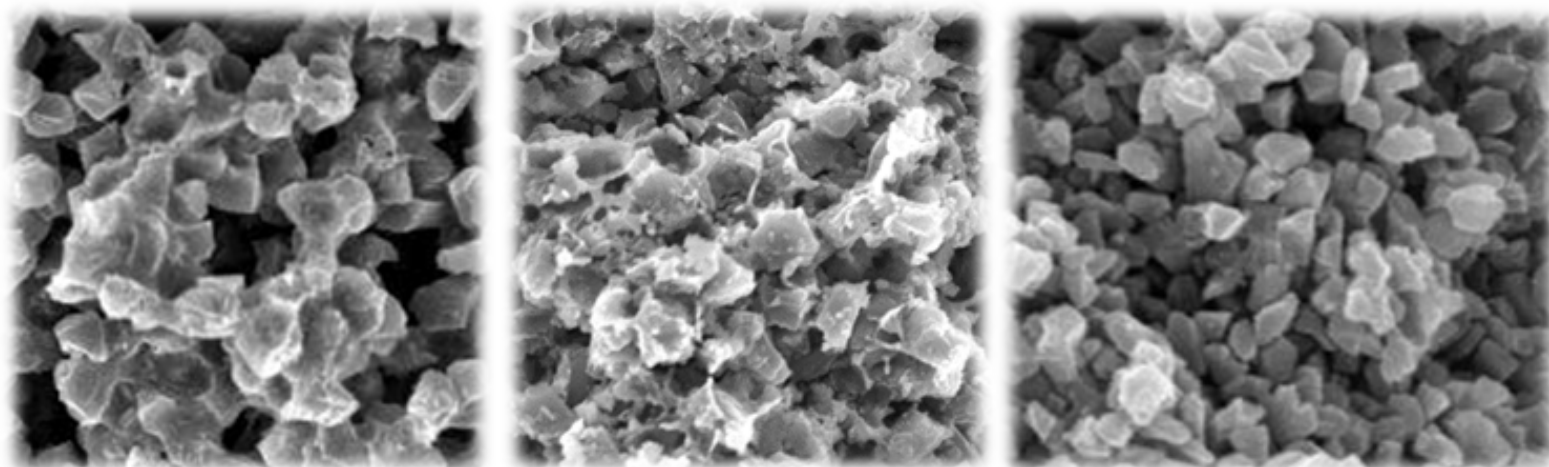
	Manufacturing track record	reference
Grit size	#2000 ~ #8000	Other specifications available upon request
Wheel size	~ Φ300	Compatible with major grinding machines
Target work	SiC • LT/LN	Applicable to other compound wafers
Capacity	50pcs / month	Production capacity expanding
Lead Time	30days	Mass production ready



Examples of customized specifications

【Customization examples】

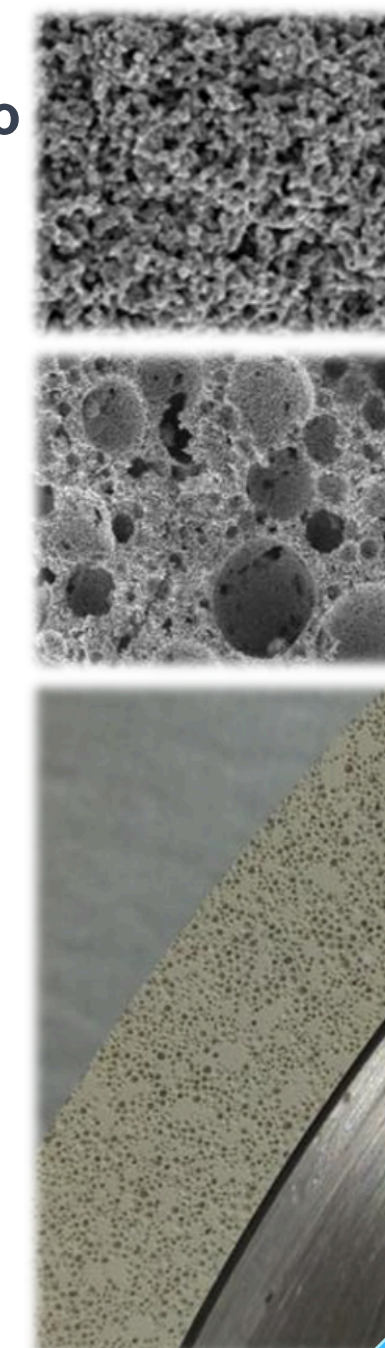
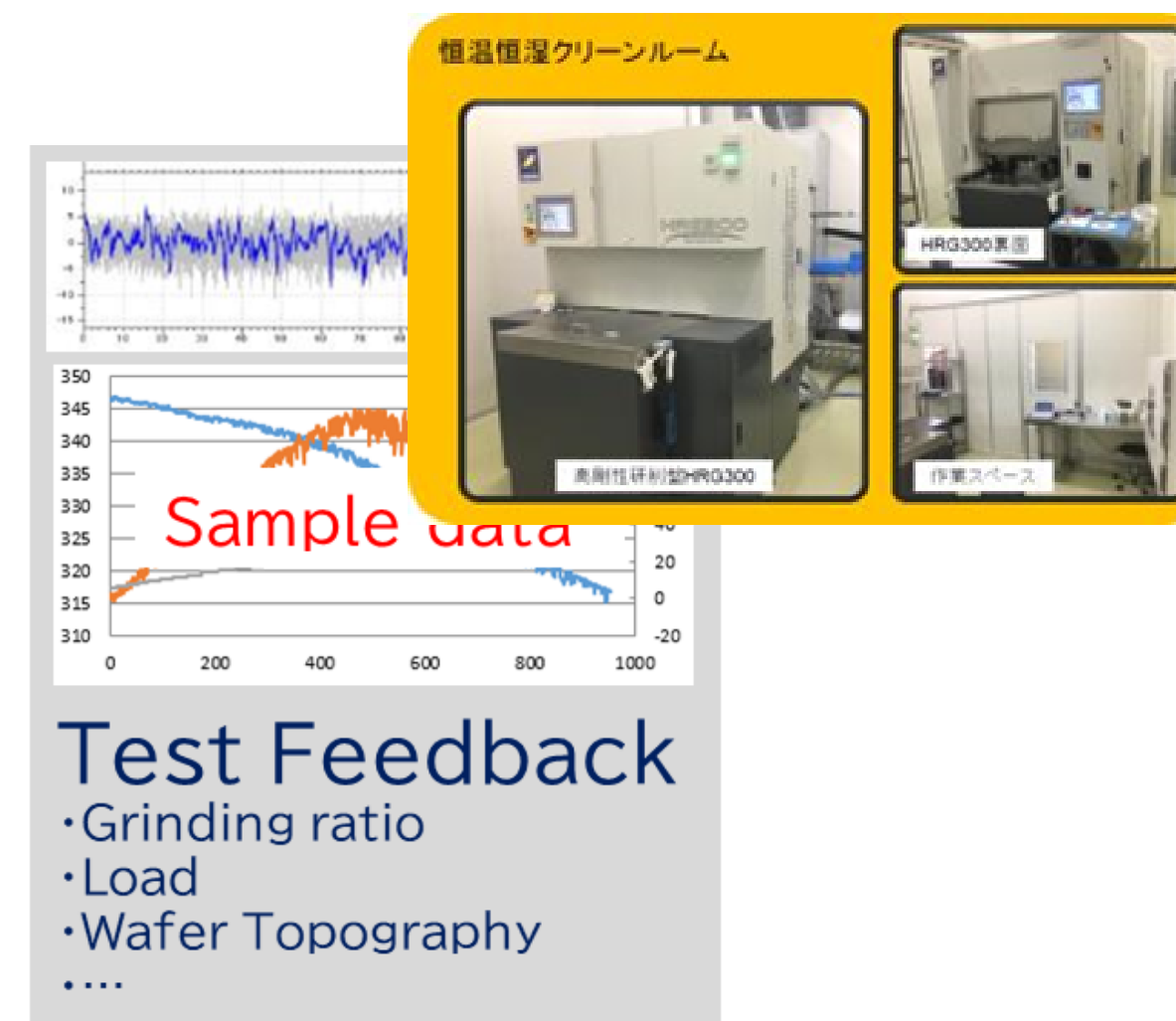
- ⚙ Abrasive grains: grit size, shape, distribution



- ⚙ Segment: optimized bond (hardness, additives), pore size/porosity, shape and arrangement



- ⚙ Grinding ratio, load conditions, and wafer topography data are continuously fed back into the development process to optimize bond structure and performance.



Coarse process (SiC 6/8 inch)

Objective:
High material removal rate with suppression of cracks and surface damage

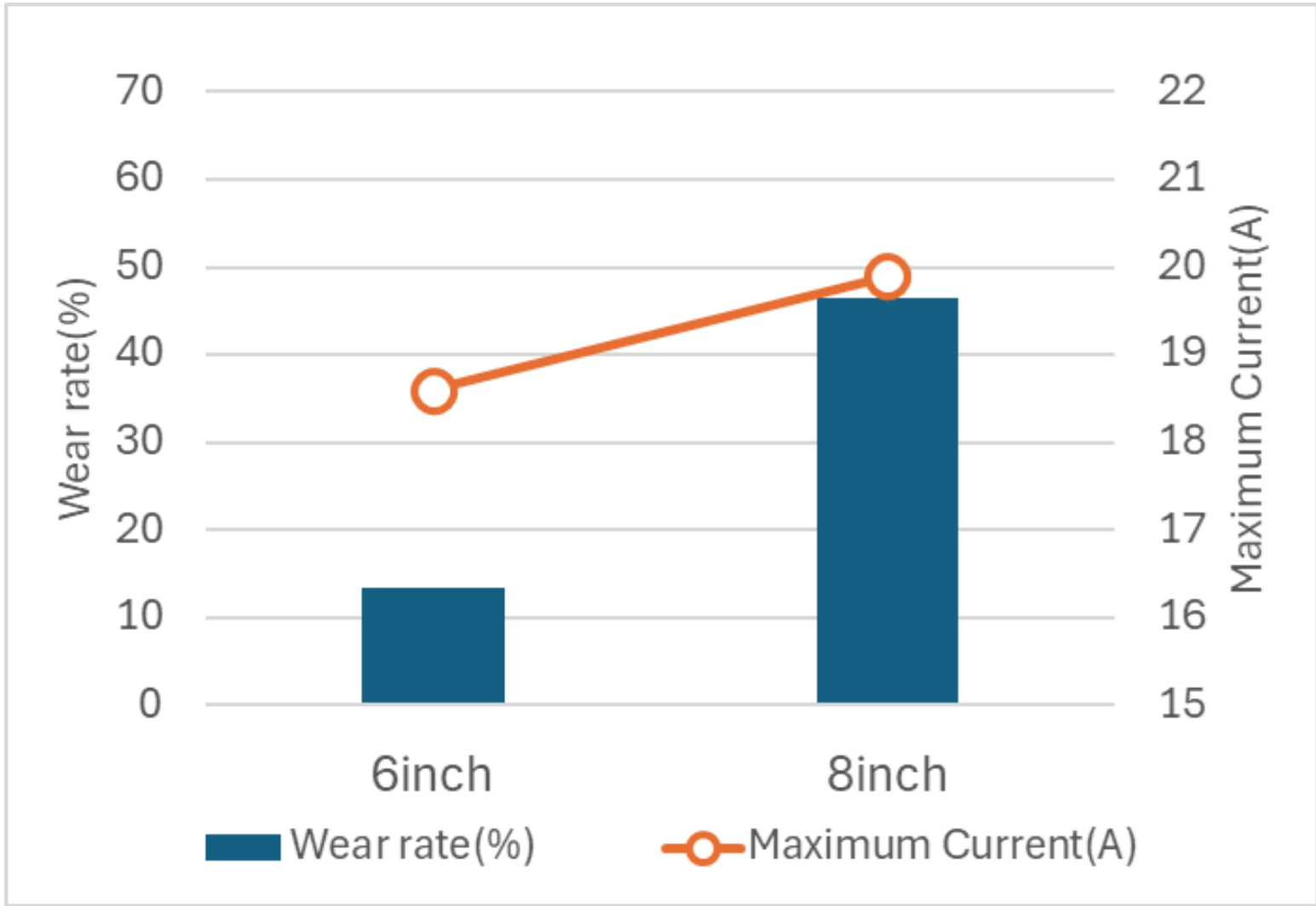
Features:
Sustained sharpness, reduced loading, and stable flatness

Recommended Range:
#1200 – #2000 (rough to intermediate grinding)

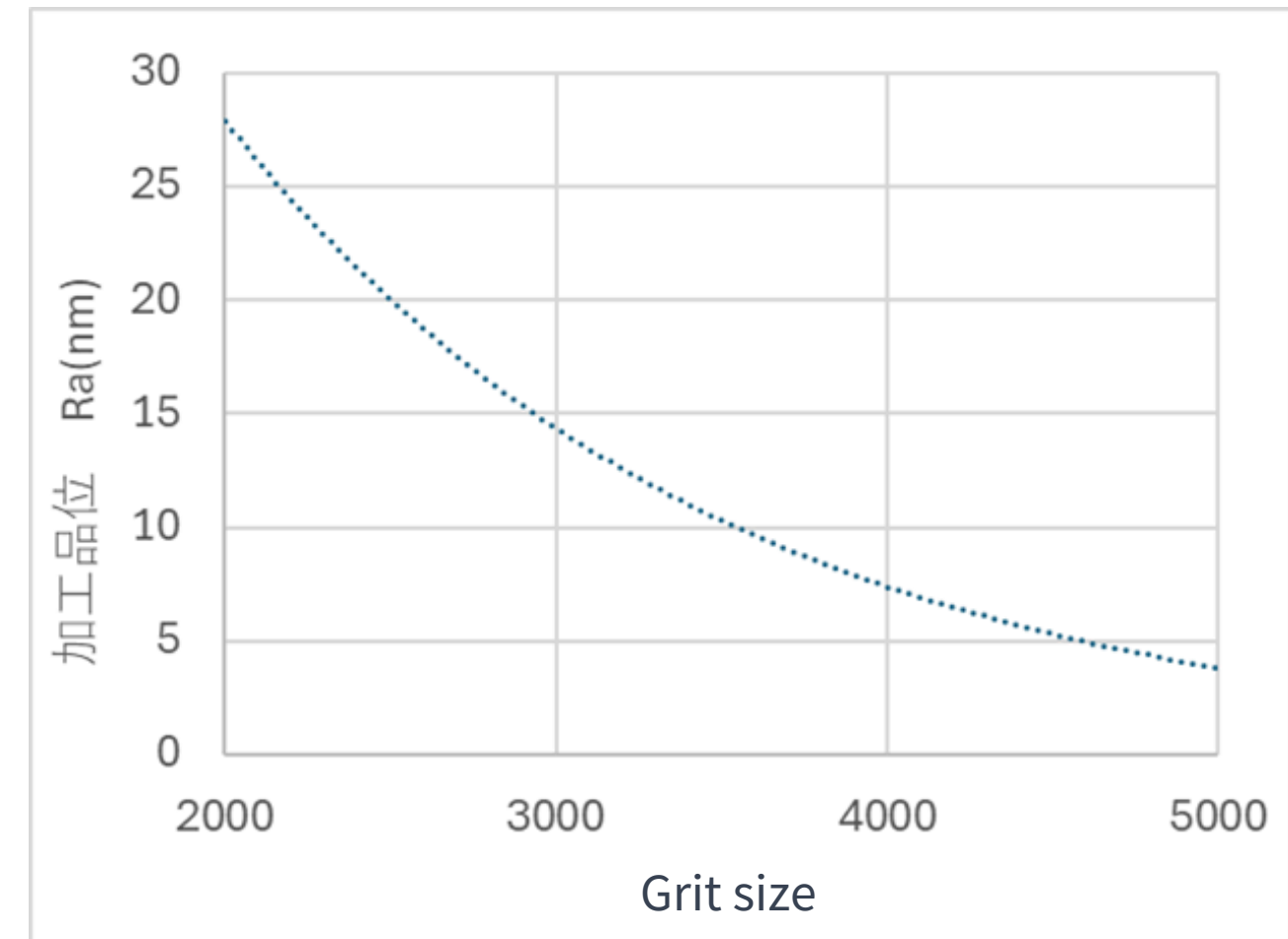
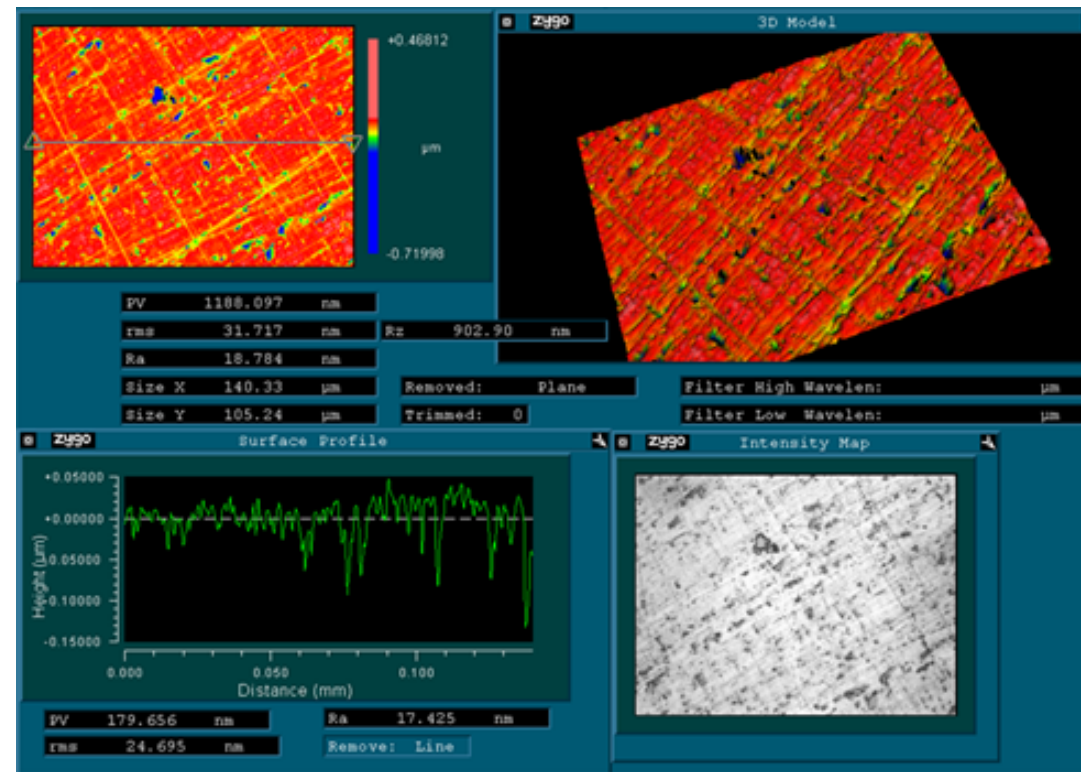
★ **SiC wafer test condition**

	6"	8"
Grinding Machine	HRG300(TokyoSeimitsu)	
Grit Size	SD2000	
Wheel Size	Φ250	
Wheel Speed	2000rpm	
Cutting Speed	0.6μm/sec	
Cutting Depth	100μm	50μm
Work Material	4H-N Si face	4H-N C face

★ **Wear rate • Current value**



About grit size & surface quality(Ra) - Coarse process

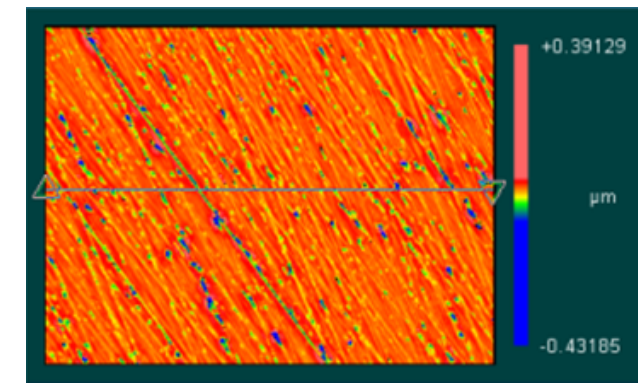


◆No deep chipping or significant cracks were observed.

→ It is inferred that grinding close to a ductile-mode regime was achieved for the SD2000 grit size.

◆Rz is relatively low, indicating a stable processed surface.

◆Ductile-mode material removal is dominant, with brittle fracture relatively suppressed.



	Ra
#2000	23~27nm
#3000	7~18nm
#4000	6~12nm

Grinding machine : HRG300 (Tokyo Seimitsu)
 Work material : 6inch SiC Ingot (4H-N) Si-Face
 Measuring instrument : Zygo NewView7300

Finishing Process (SiC 6/8 inch)

Objective:

Improve surface roughness (Ra) and reduce downstream process load

Features:

Low-damage processing enabled by fine cutting edges

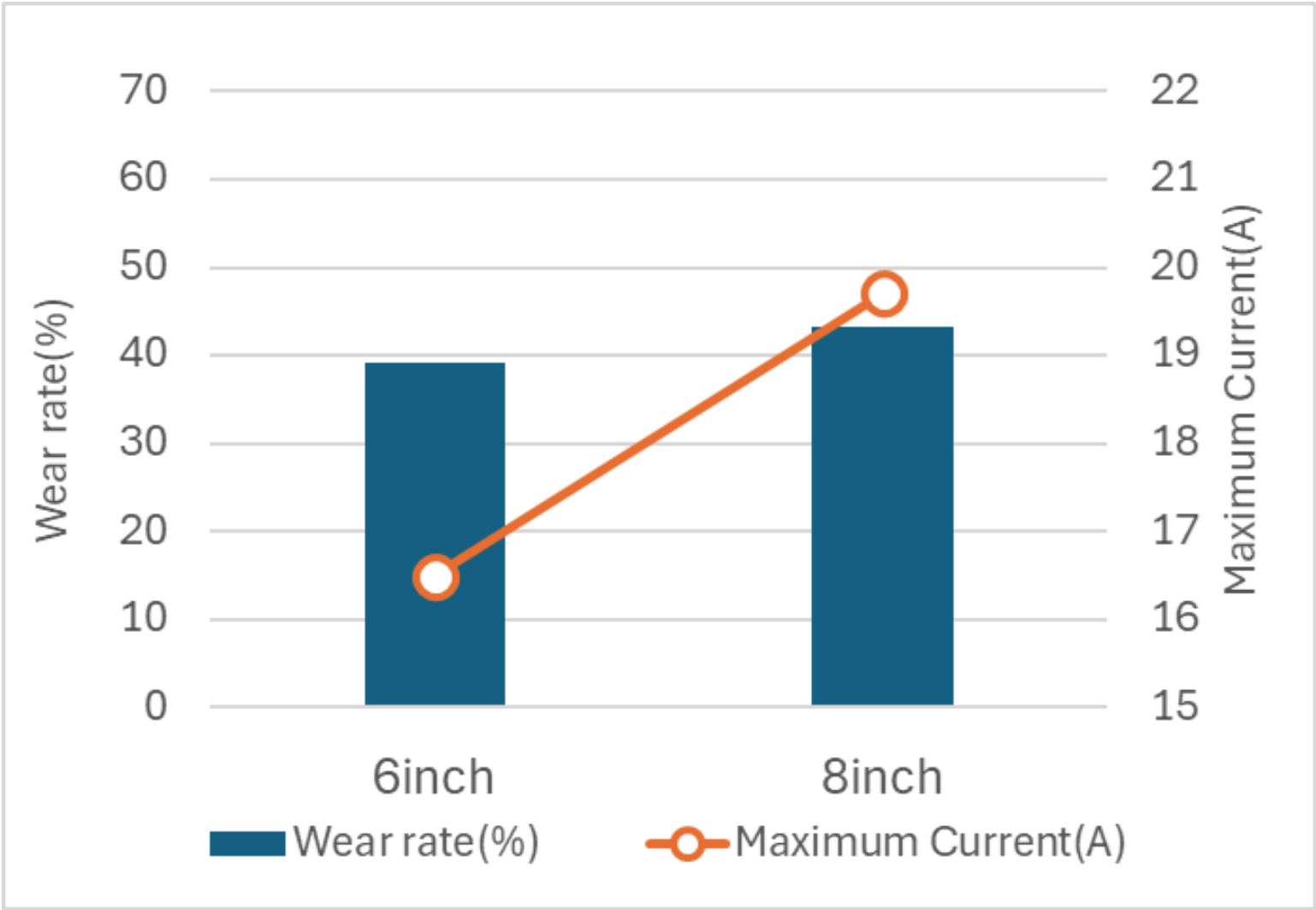
Recommended Range:

#4000 – #7000 (finish grinding)

★ **SiC Wafer grinding condition**

	6"	8"
Grinding Machine	HRG300(TokyoSeimitsu)	
Grit Size	SD8000	SD7000
Wheel Size	Φ330	
Wheel Speed	2,500rpm	
Cutting Speed	0.3μm/sec	0.2μm/sec
Cutting Depth	25μm	30μm
Work Material	4H-N Si face	4H-N C face

★ **Wear rate • Current value**

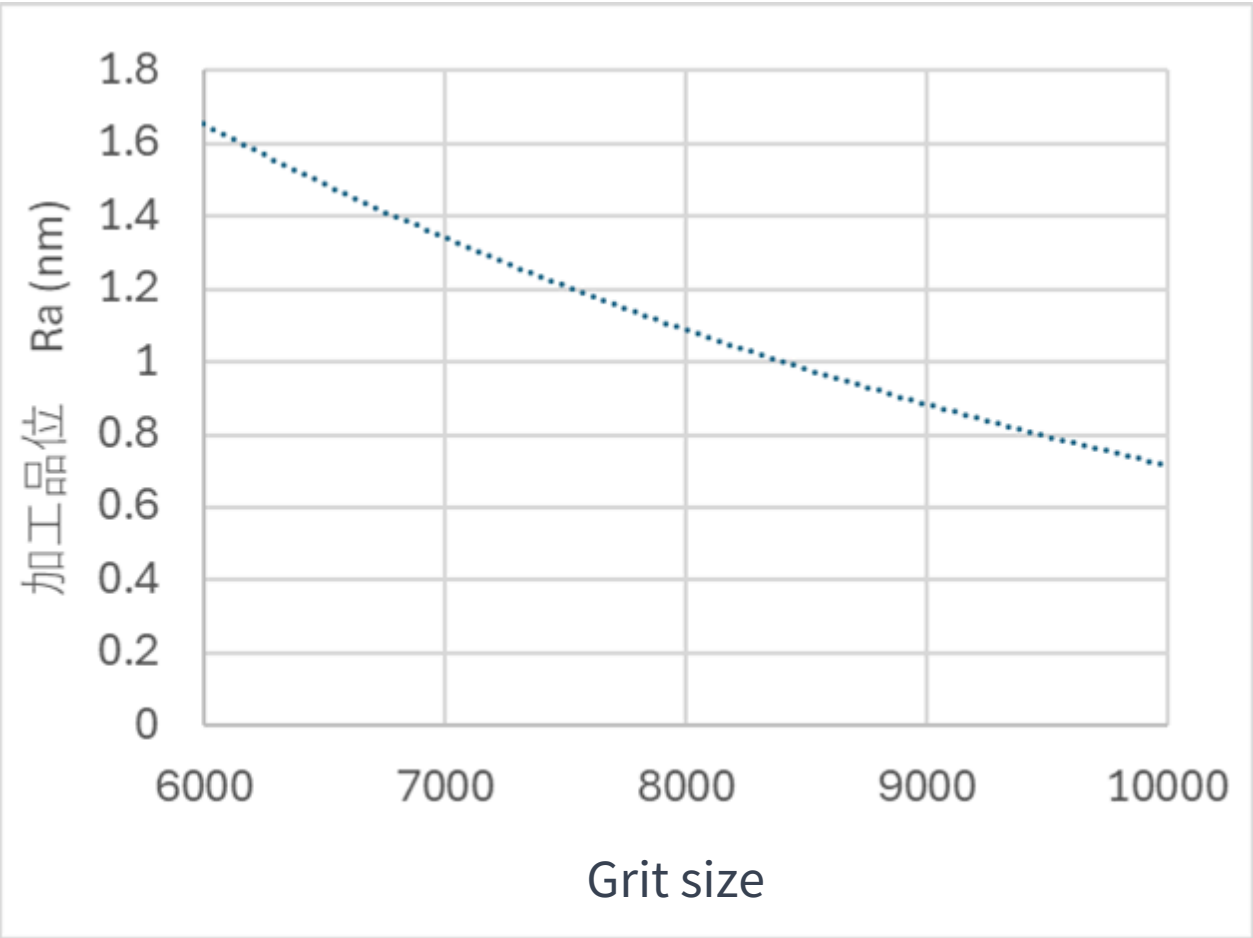
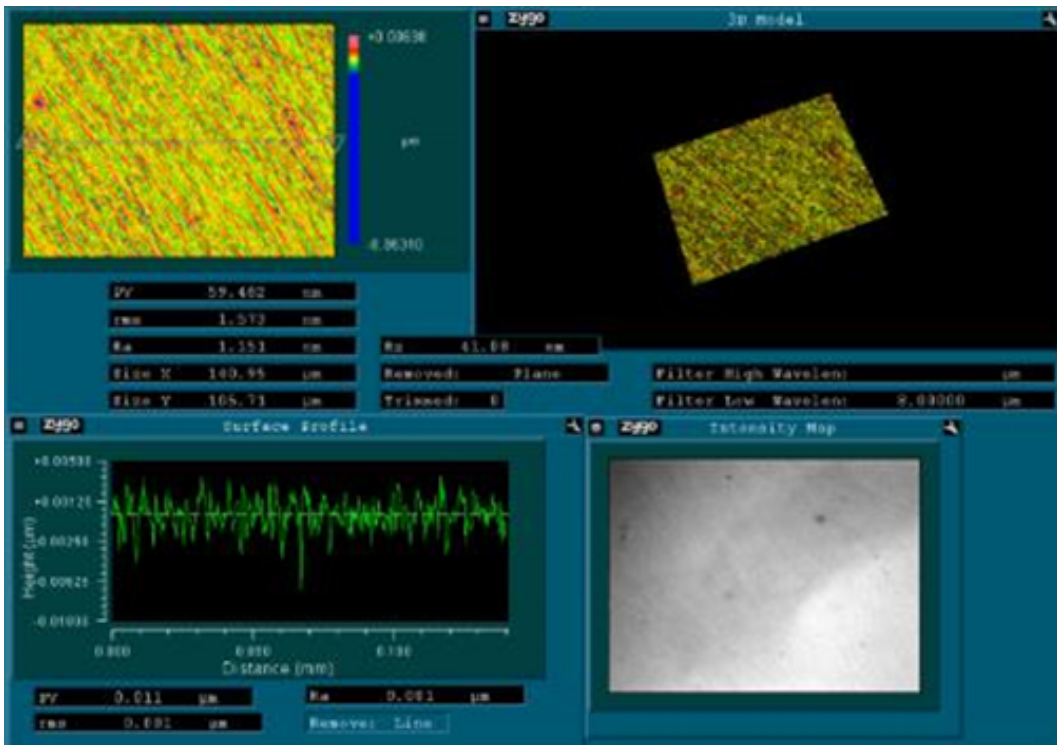


Achieves nano-level surface finish (Ra ~1 nm) with stable grinding performance.

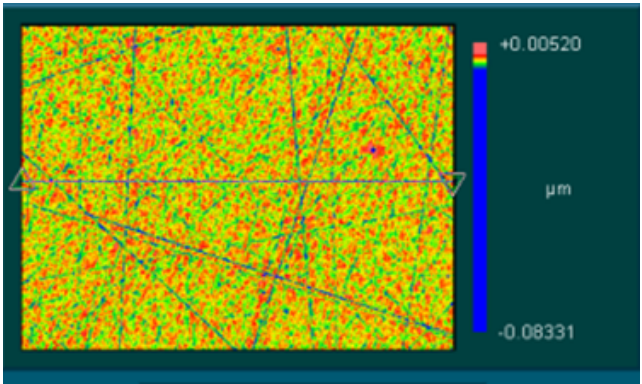
Wear rate and maximum current increase with wafer size while maintaining efficient material removal under higher load conditions.



Surface Finish Capability — Nano-Level Ra Control - Finishing process



Surface roughness reaches the nanometer level (Ra ~1 nm), enabling ultra-high-quality surface finishing suitable for subsequent processes such as CMP.



Grit size	Ra
#7000	1.2~1.9nm
#8000	1.0~1.4nm
#10000	0.7~0.9nm

Grinding machine : HRG300 (Tokyo Seimitsu)
Work material : 6inch SiC Ingot (4H-N) Si-Face
Measuring instrument : Zygo NewView7300



About grit size & surface quality(Ra) - Reference

The achievable surface quality (Ra) varies depending on the grit size. By selecting an appropriate grit size, the target surface roughness can be achieved.

Relationship between grit size and Ra

- > **#2000 Coarse range**
Enables high-efficiency material removal (relatively higher Ra, i.e., rougher surface finish)
- > **#4000 Mid finishing range**
Balanced surface finish and efficiency (moderate Ra))
- > **#7000+: final finishing range**
Enables high-quality surface finishing (low Ra)

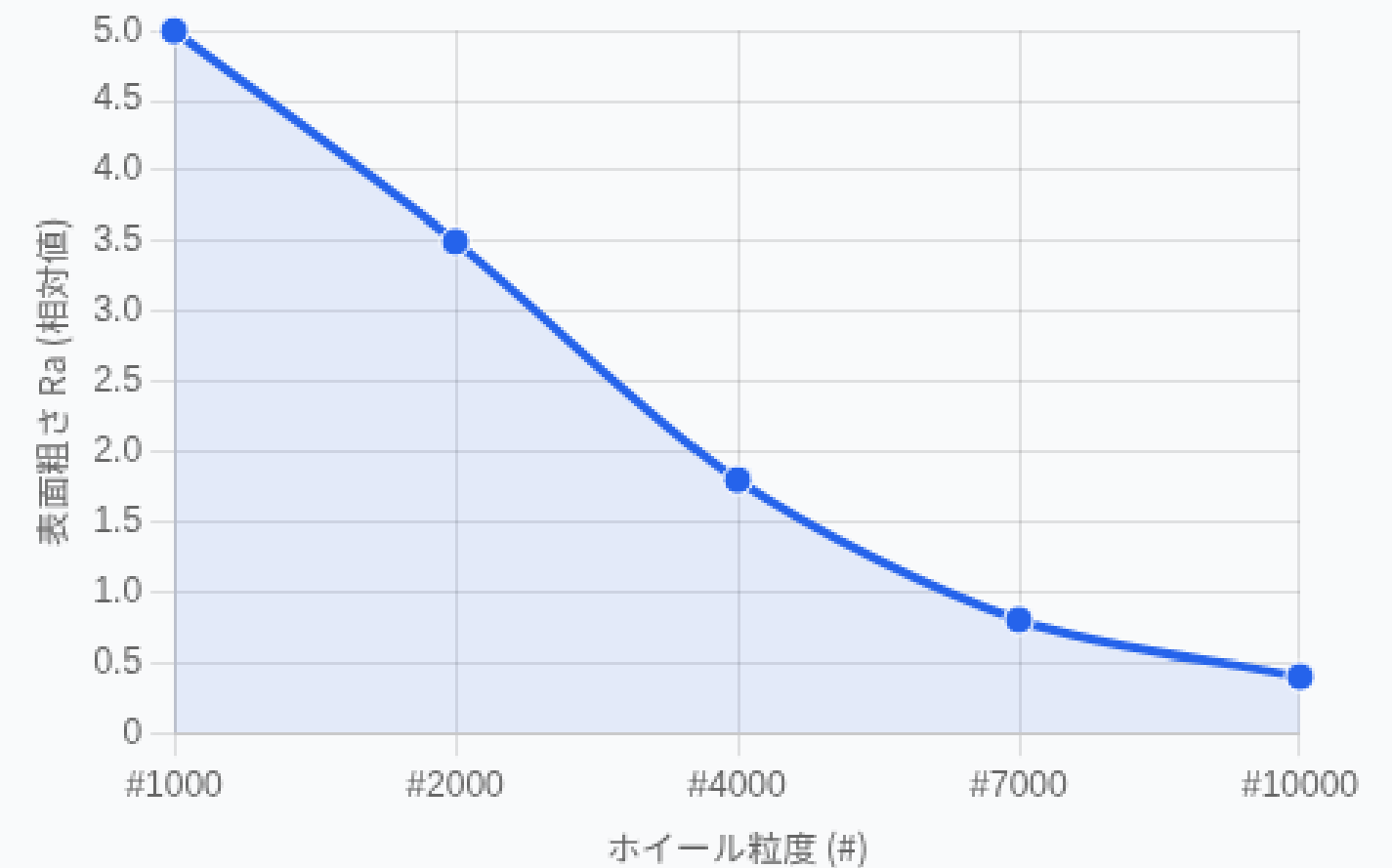
Important notice

The measured Ra depends on the following factors:

- Machine rigidity
- Grinding conditions (wheel speed, depth of cut, feed rate)
- Coolant type and supply method
- Truing and dressing conditions

※ Selecting the optimal grit size according to the customer's processing conditions is essential.

Relationship between grit size and Ra



Processing trade-off: higher grit size improves surface finish, but tends to increase processing time.

#2000

Ra ↓
High efficiency

#4000

Ra →
Balance

#7000~

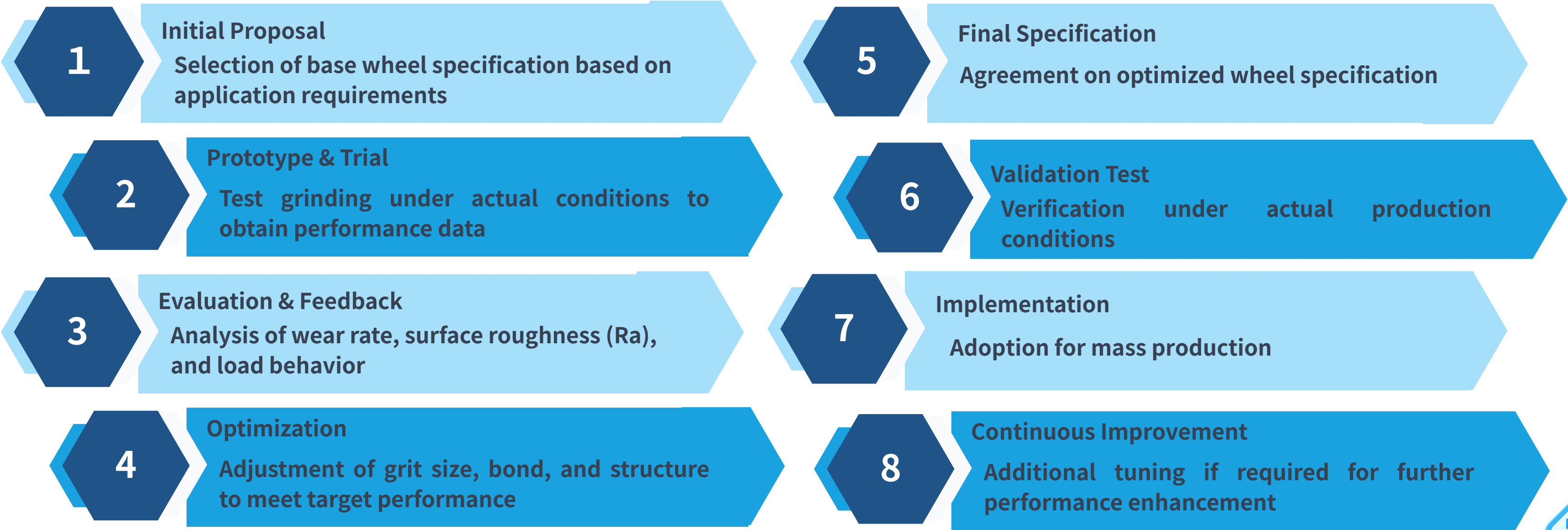
Ra ↑
High quality



【Reference】 Tuning process for low wear and sharp cutting performance

BENEFIT FOR CUSTOMERS

- ✓ Minimizes risk of unexpected issues
- ✓ Reduced total cost through proper condition setting
- ✓ Ensure peak performance in actual production



~ LT/LN grinding case ~



LT/LN process (6 inch)

★ LT wafer test condition

	Coarse	Fine
Work Material	6" LT	
Grinding Machine	HRG300	
Wheel Size	Φ246	
Grit Size	#2000	#7000
Wheel Speed	0.8μm/sec	0.5μm/sec
Removal thickness	20μm	20μm
Wear rate	≒ 0%(less than 5%)	60~70%*

*“Under high-precision finishing conditions”

This data represents a specification achieving both low wear and stable continuous processing. Proven for both rough and finish grinding, with optimization and customization available to meet your specific requirements.

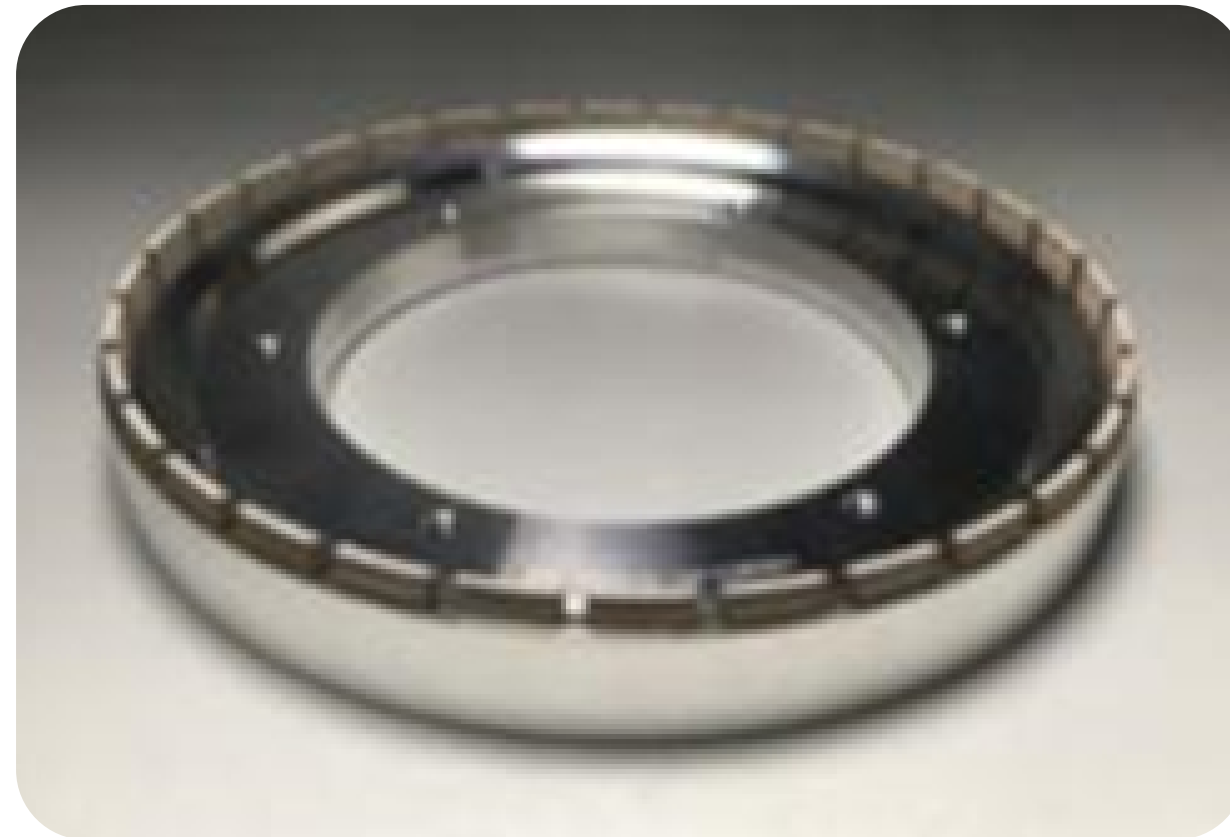
★ LN wafer test case



We also have proven experience in LN wafer processing and are continuously accumulating and refining performance data. Leveraging our expertise in SiC and LT applications, we can propose optimized solutions tailored to your specific requirements.



Ready for the Next Evaluation



**Leveraging the lessons learned from previous developments,
we continue to improve wheel performance and process stability.
We welcome the opportunity to evaluate optimized specifications for your application.**

