

NANOPOL (VITRIFIED) COMPOUND WAFER GRINDING WHEEL



Wheel Line-Up

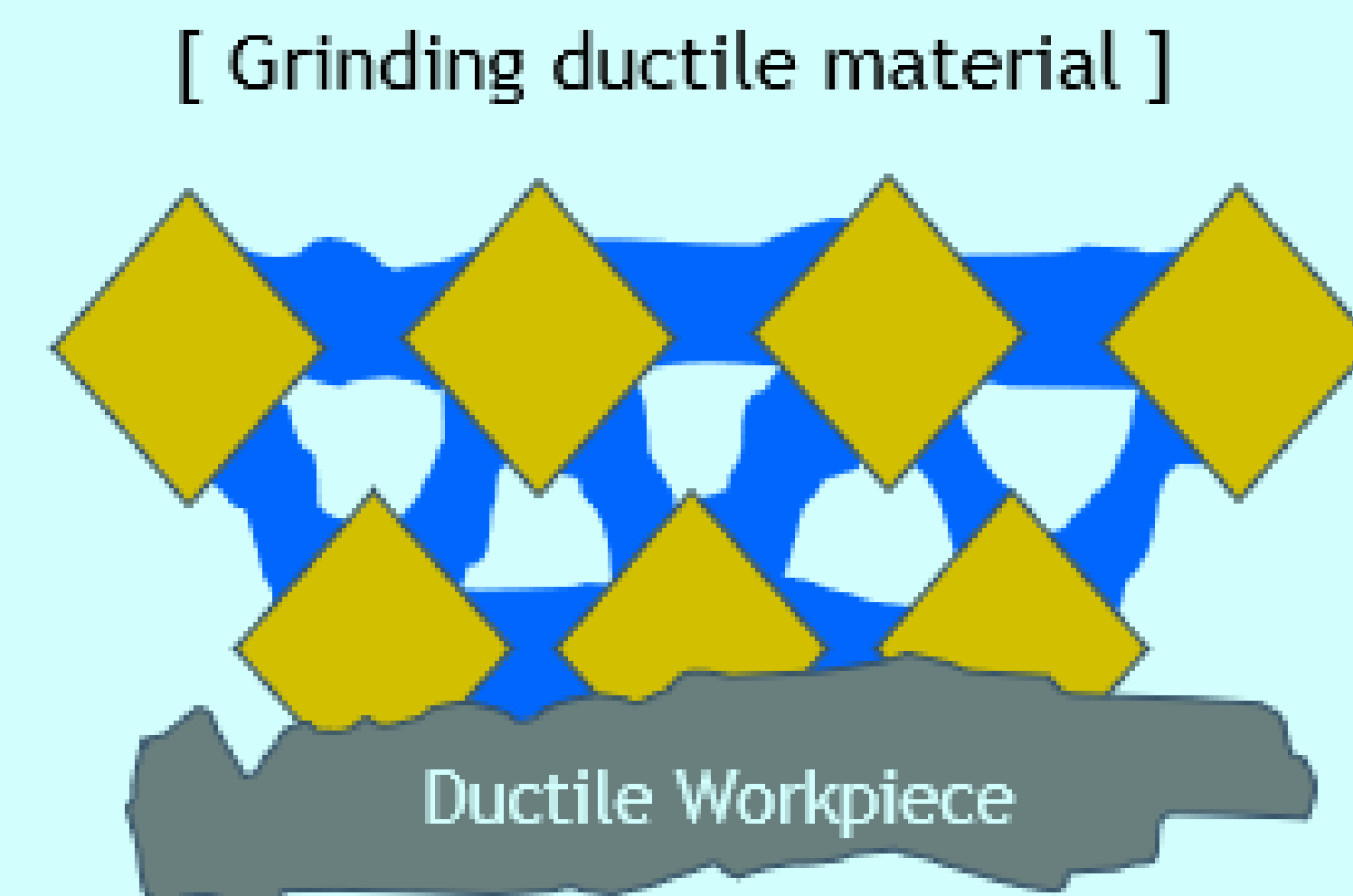
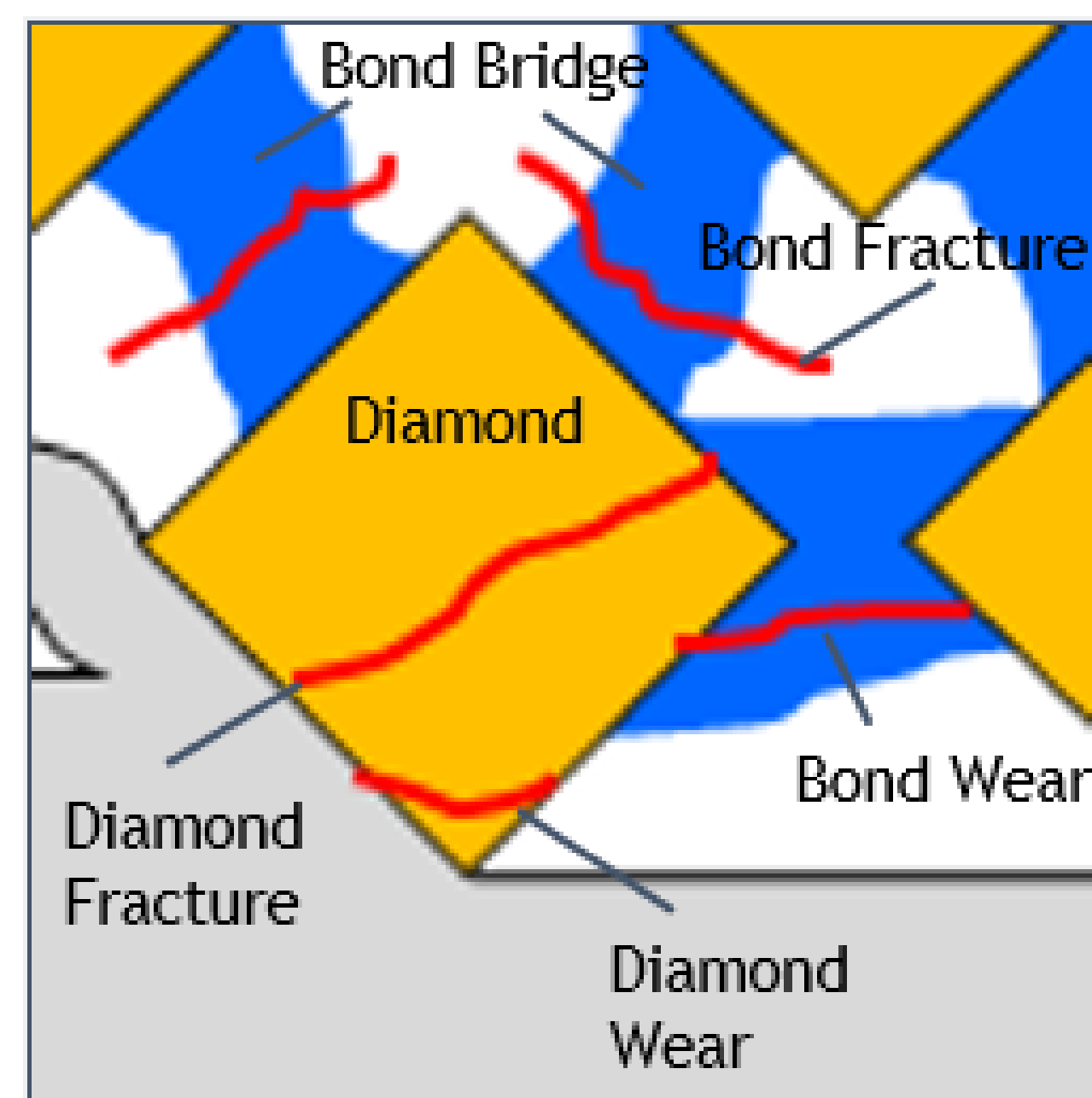
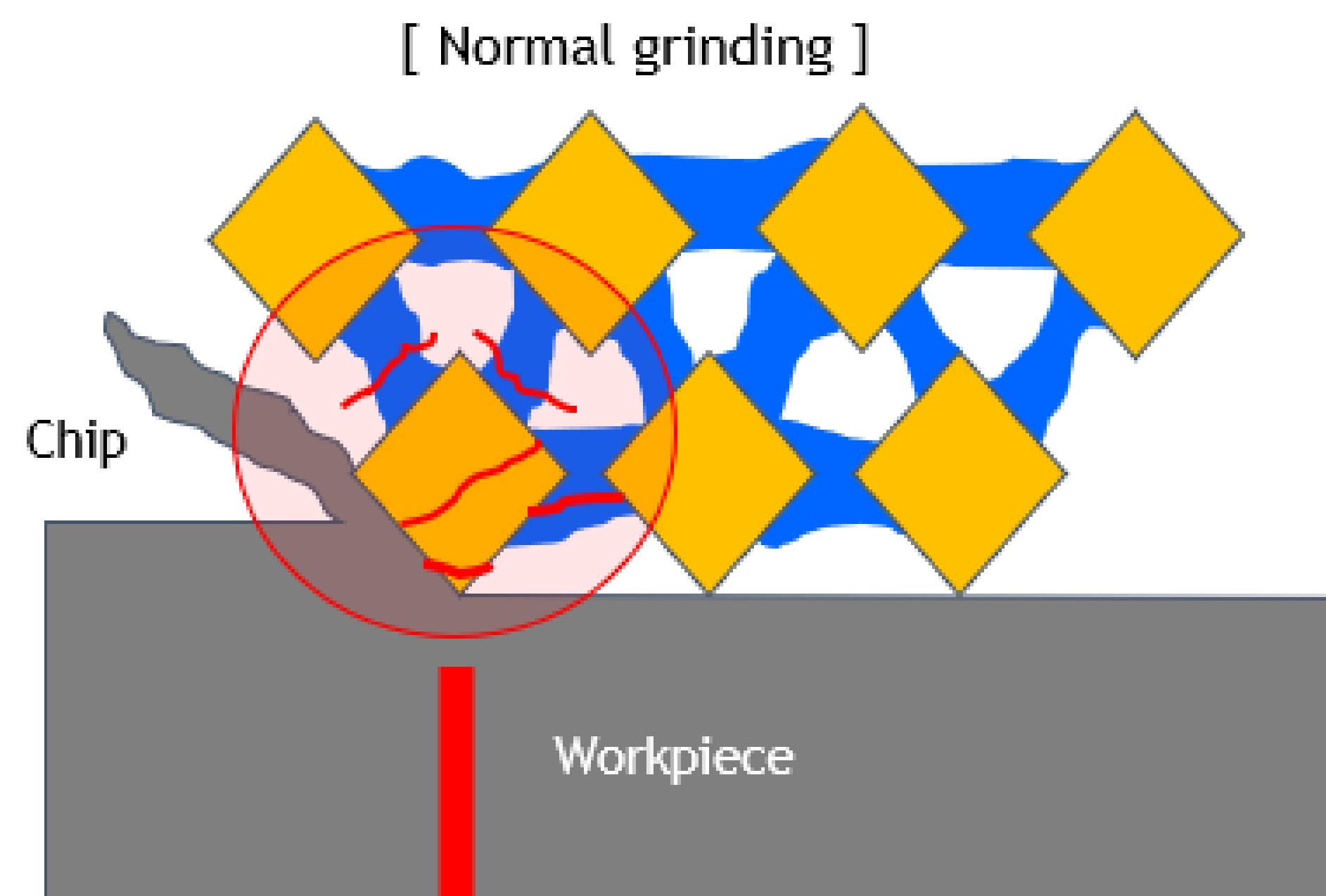
Z1(Rough)				Z2 (Fine & Polishing Level)				
#400	#600	#800	#1000	#2000	#3000	#4000	#5000	#6000
VSP Series								
		VSBT Series						
				VSPS Series				
							VK8B	
					VK8HS			

Technology

- Wafer surface roughness and die strength can be improved
- Grinding stress and wafer edge chipping can be reduced
- Diamond at the tip can be distributed consistently
- Porosity, pore shape and pore size control can be adjusted
- Possible to grind Si wafer up to 17 μ m (Ultra thin wafer)
- Outstanding grinding ability for TSV and normal (for finger print) compound wafer

NANOPOL (VITRIFIED) COMPOUND WAFER GRINDING WHEEL

Grinding Mechanism of Normal Grinding(Ex. Si Wafer) and Ductile Material Grinding (Ex. Compound Wafer)



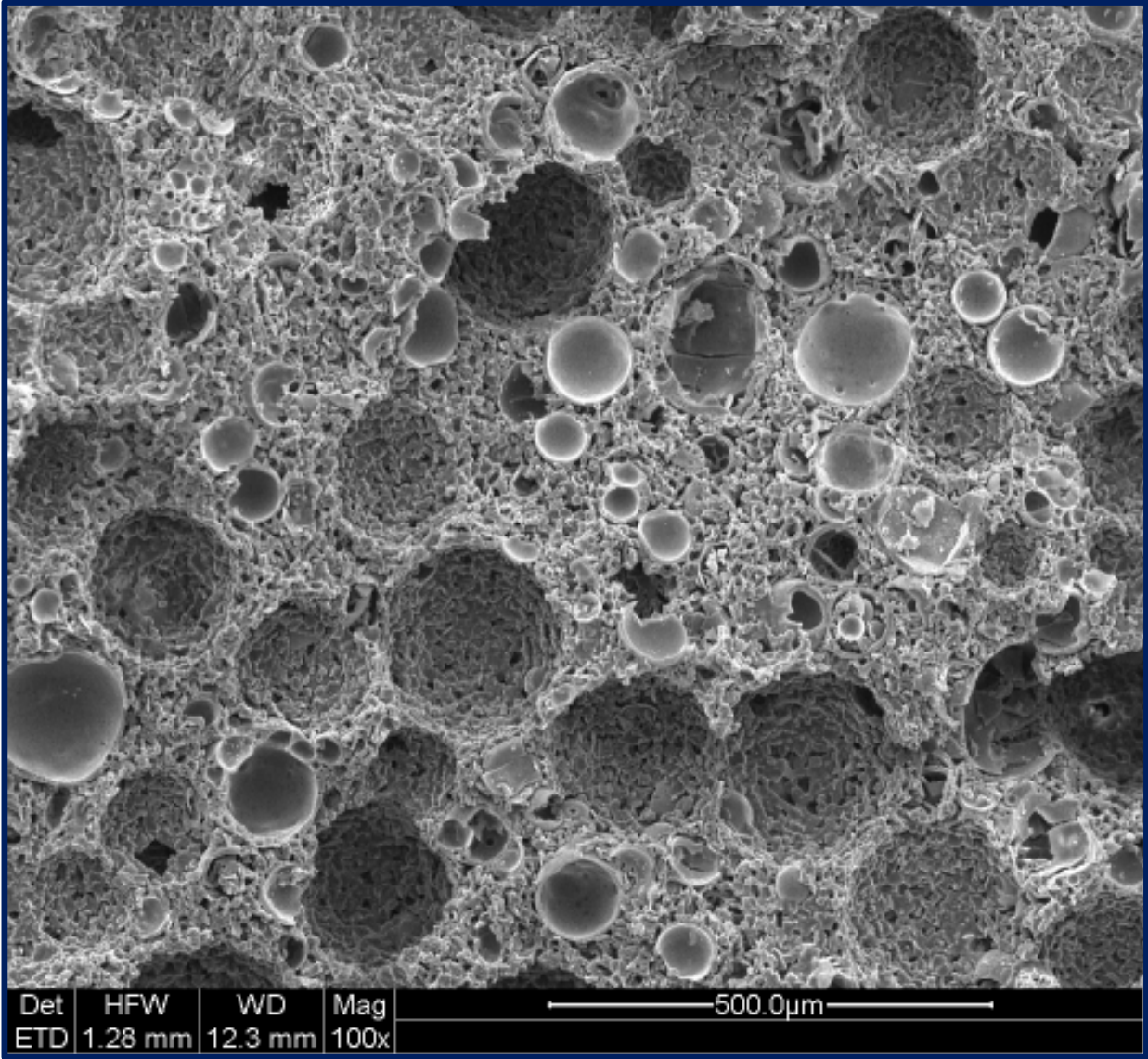
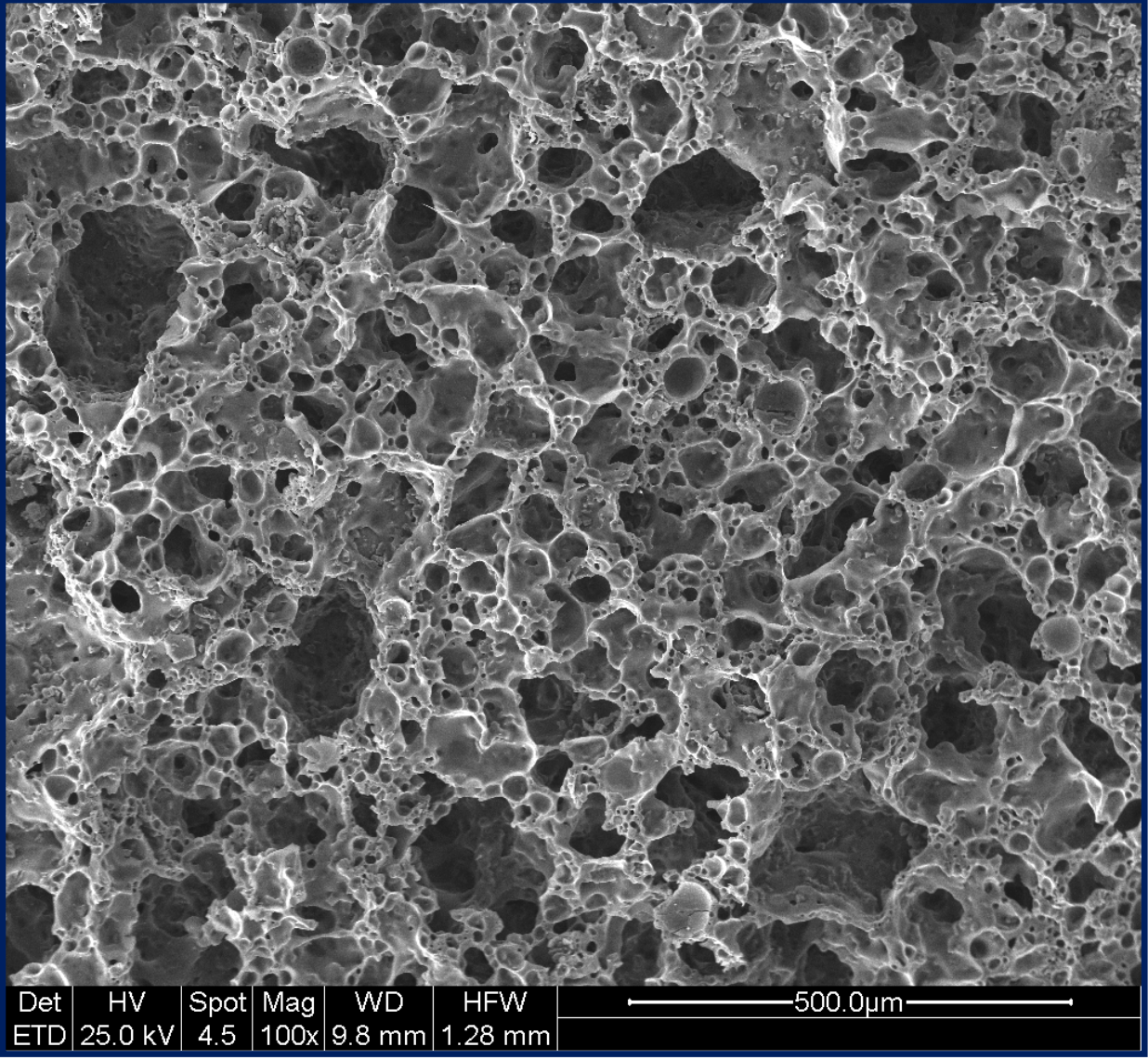
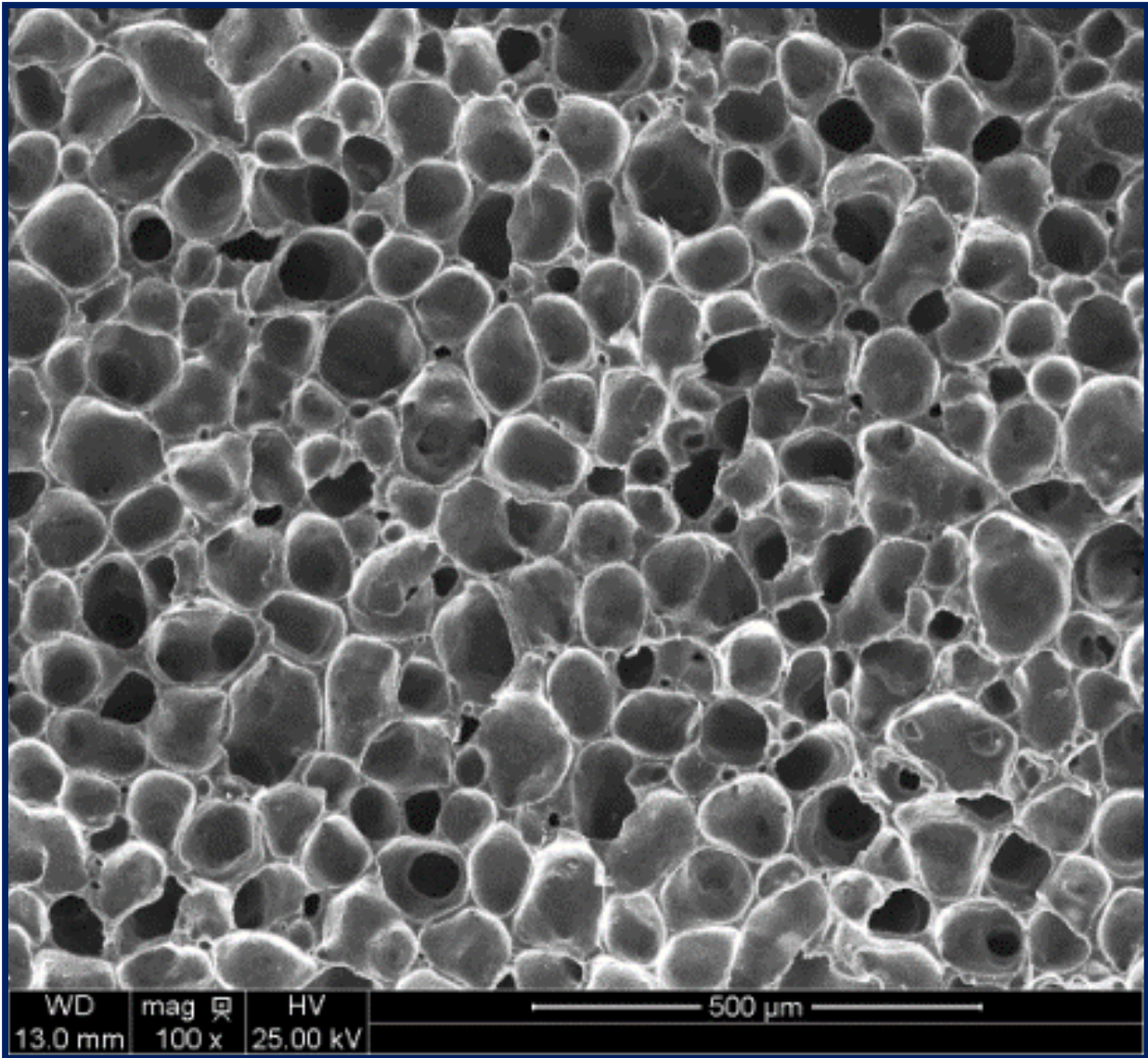
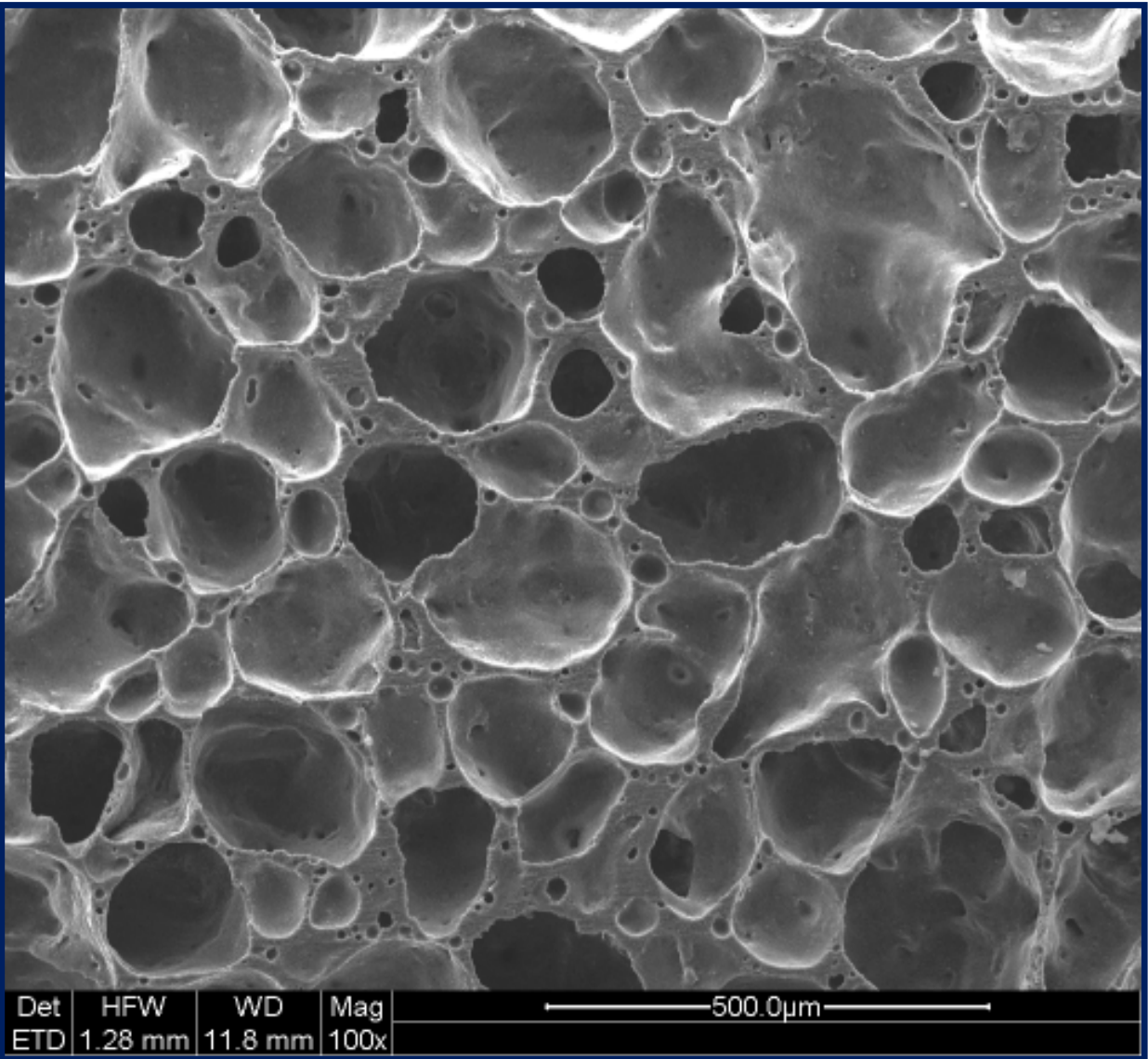
In the case of ductile materials, diamond wear, diamond fracture, bond wear, and bond fracture do not occur due to their low hardness. As a result, normal processing is not carried out, and the workpiece gets stuck on the wheel surface.

By lowering the bond hardness and reducing the bond content, the thickness of the bond bridge is reduced. This increases wheel wear as much as possible, allowing soft materials attached to the surface to be removed quickly.

Grinding Mechanism of Normal Grinding(Ex. Si Wafer) and Ductile Material Grinding(Ex. Molded Wafer)
As processing progresses, diamond wear and fracture occur, bond wear happens, and new diamond inside the wheel is released, allowing for continuous smooth processing.

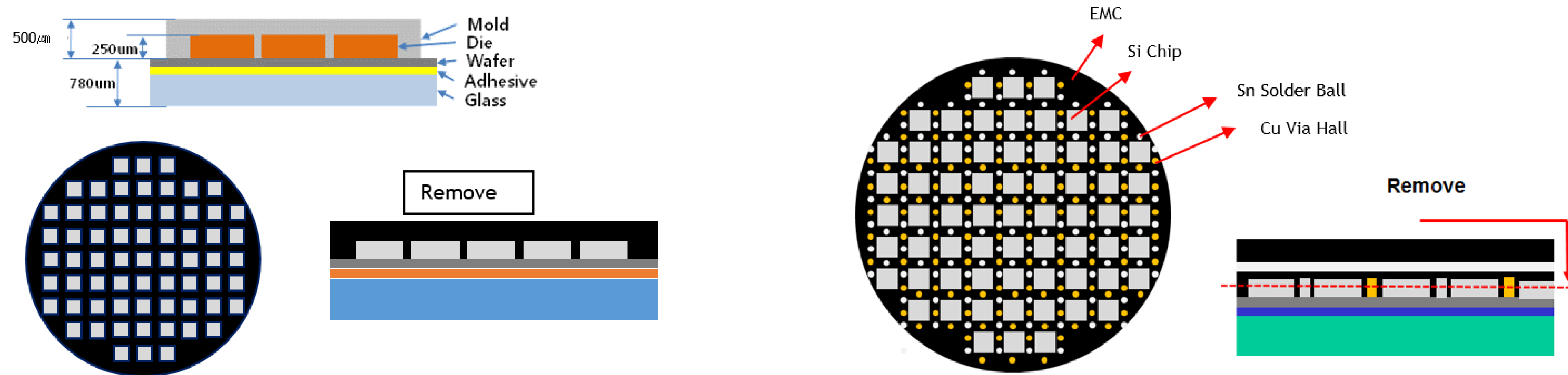
NANOPOL (VITRIFIED) COMPOUND WAFER GRINDING WHEEL

Wheel Structure of Si Wafer Wheel Vs. Compound Wafer Wheel

	Wheel for Grinding Si Wafer	Wheel for Grinding Compound Wafer
Rough Wheel		
Fine Wheel		

NANOPOL (VITRIFIED) COMPOUND WAFER GRINDING WHEEL

Compound Wafer Structure and Wheel Spec.



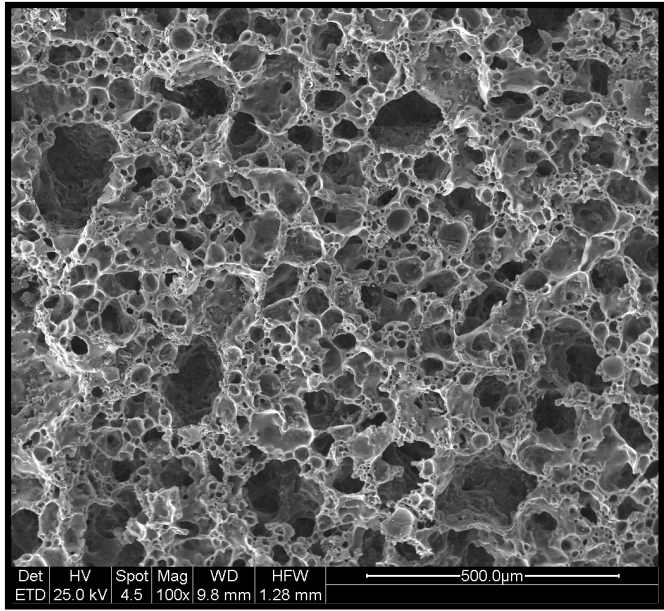
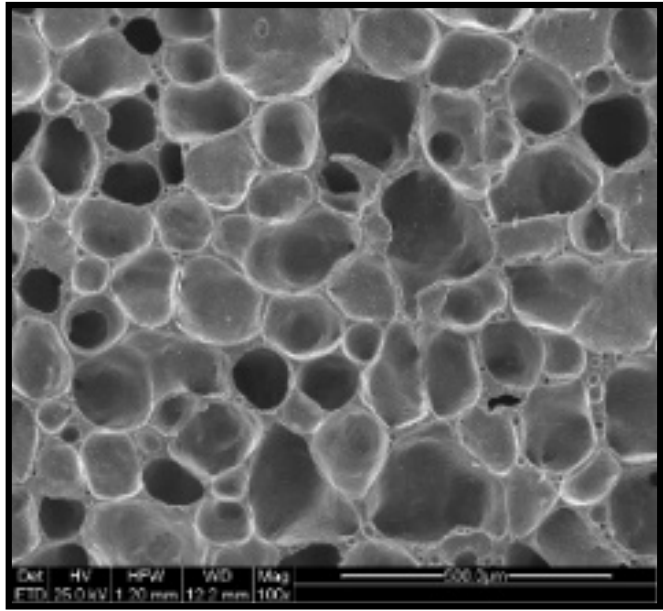
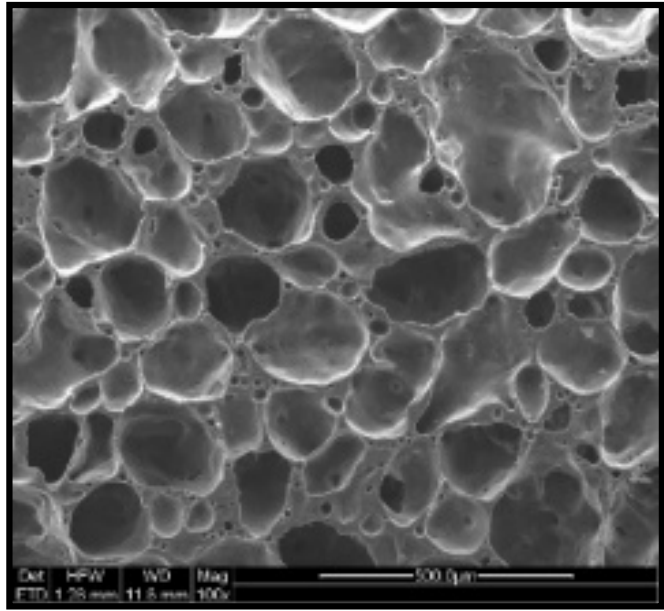
Material	Wheel Spec.
Compound(Ex. EMC)	#325 ~ #2000 VSP3, #325 ~ #2000 VSP5
Compound + Silicon Chip	Z1 #400 VSP3 + Z2 #4000 ~ #5500VK8HS,
Compound + Silicon Chip + Copper Via	
Compound + Silicon Chip + Copper Via + Polyimide + Solder	Z1 #800 VSP3 + #3000 VK8HS4 / Z1 #800 VSP3 + #4000 VSP510

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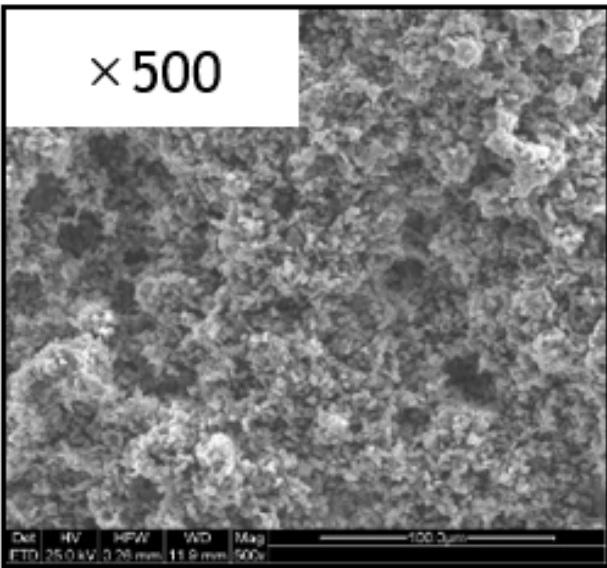
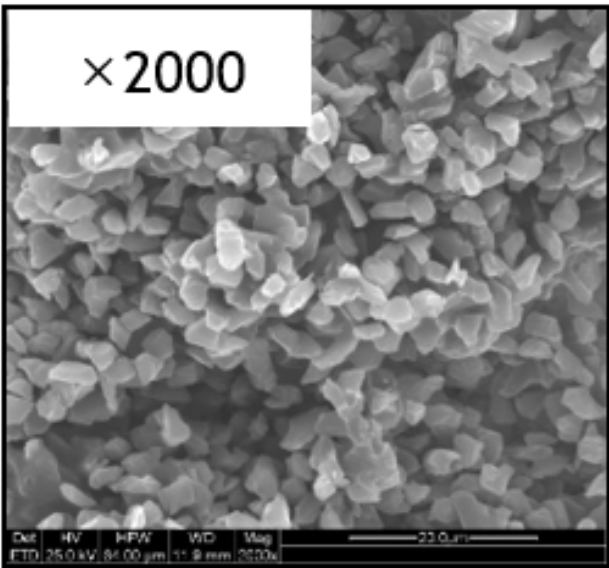
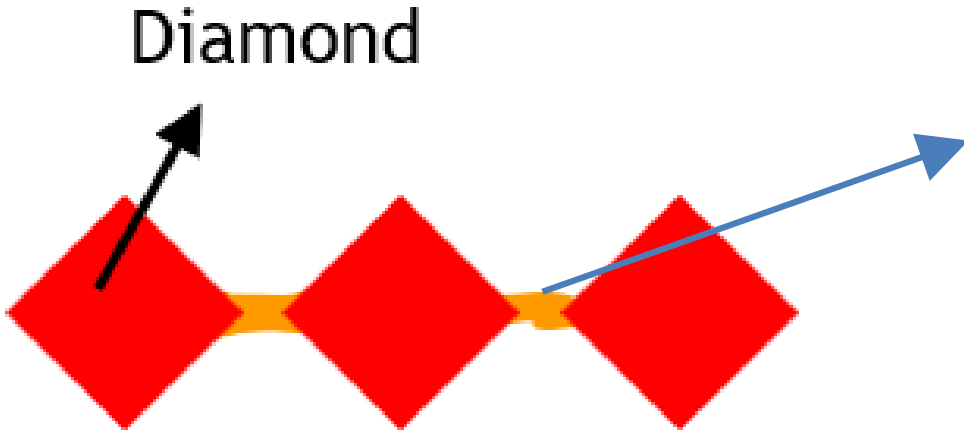
Wheel Concept for Compound Wafer Grinding

Ductile materials such as EMC, Polymer, Cu, Sn etc. have a high tendency to adhere to the tip surface. Therefore, following 2 methods can be used for developing a wheel for grinding ductile materials properly.

1) Intentionally make the tip structure weak, so that the glazed tip can be worn easily. ⇒ **VSP3 and VK8HS**

Specification	#800-VSP3	#4000-VK8HS	#5000-VK8HS
Micro Structure (SEM, ×100)			

2) When there is still glazing phenomenon even with the wheel with structure (1), we can make the bond bridge between diamonds very thin and make the wheel wear as fast as possible so that ductile materials can be worn out with tips as soon as it adheres to the tip surface ⇒ **VSP5, VSPS10**

Specification	#3000-VSPS10		
Micro Structure (SEM)			 Bond Bridge : Bridge is thin so it can be Worn or broken easily.

NANOPOL (VITRIFIED) Si WAFER GRINDING WHEEL

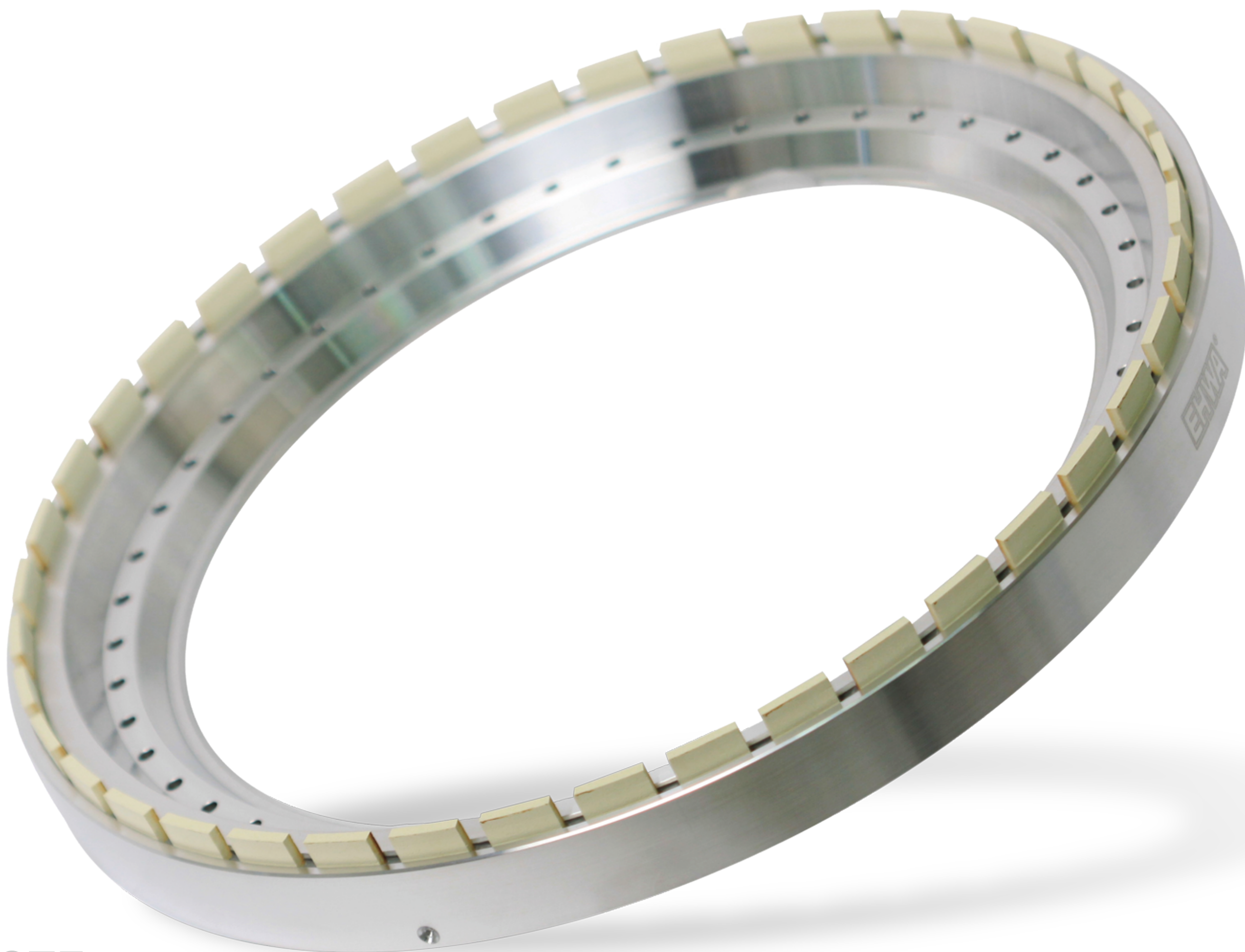
Technology

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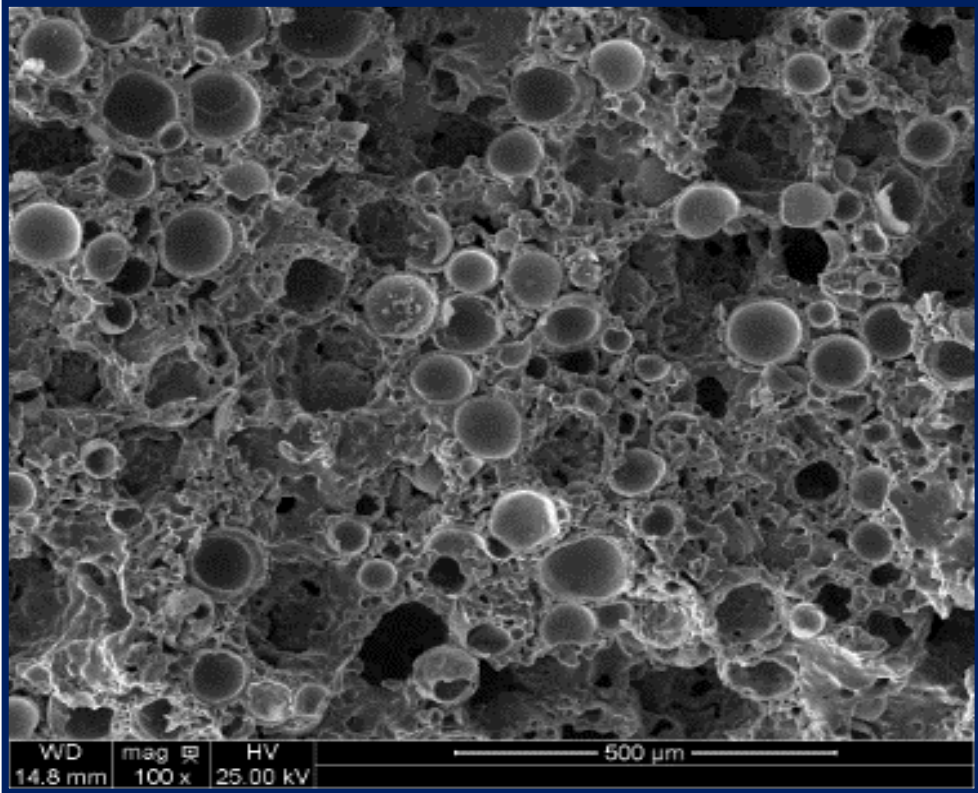
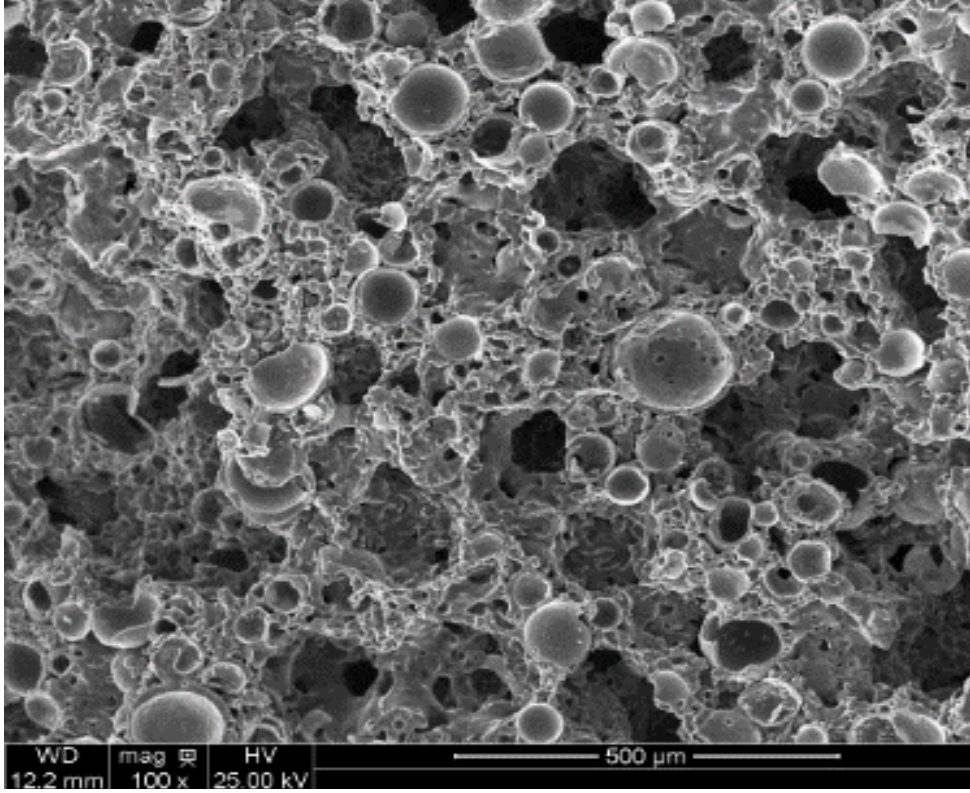
Wheel Line-Up

Z1(Rough)				Z2 (Fine & Polishing Level)								
#400	#600	#800	#1000	#2000	#3000	#4000	#5000	#6000	#8000	#10000	#20000	#30000
VSZT												
						VK8B						
						VKBT						
								VNP				
								VGP				



NANOPOL (VITRIFIED) Si WAFER GRINDING WHEEL

I Z1 Wheel Spec. & Performance (Machine : DGP8761)

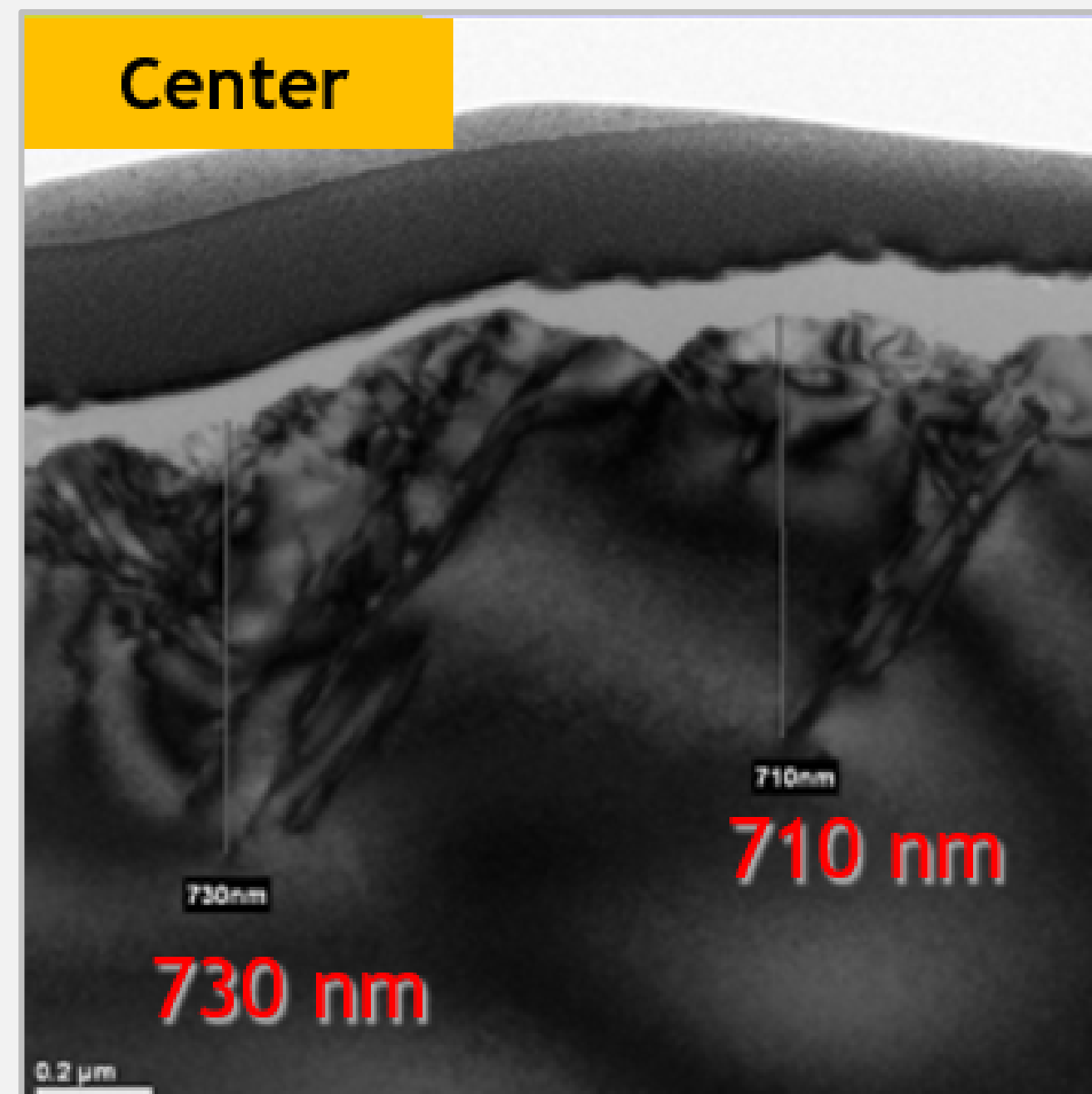
Wheel Spec.		NP-D4-303D3.5W10X-600-VSZT	NP-D4-303D3.0W10X-800-VSZT
Grit Size		Mean : ~20 μ m, Max : ~63 μ m	Mean : ~16 μ m, Max : ~41 μ m
Concentration		75	
Porosity [Volume %]		~75%	
Bond		VSZT	
SEM Image [×100]			
Test Result (DGP8761)	Recipe	1. Wheel / Chuck RPM : 2700/300 2. Feed [μ m/s] : 5-3-1	1. Wheel / Chuck RPM : 3200/300 2. Feed [μ m/s] : 5-3-1
	Grinding Current [A]	~ 13.0	~ 14.0
	Wheel Life [Pcs]	15,000	12,000

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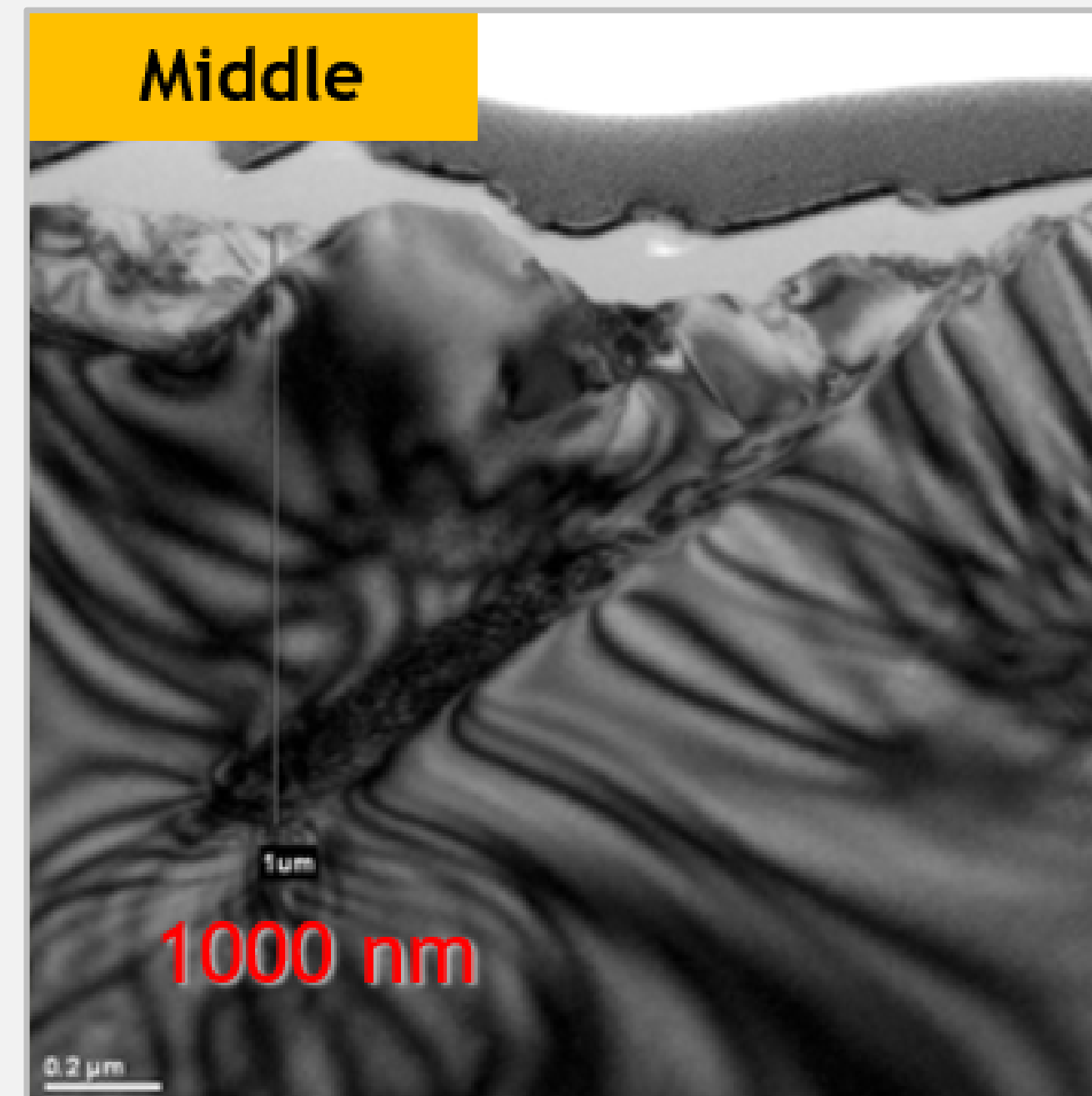
Si Wafer Surface Damage Layer After Z1 Grinding

Resin #325

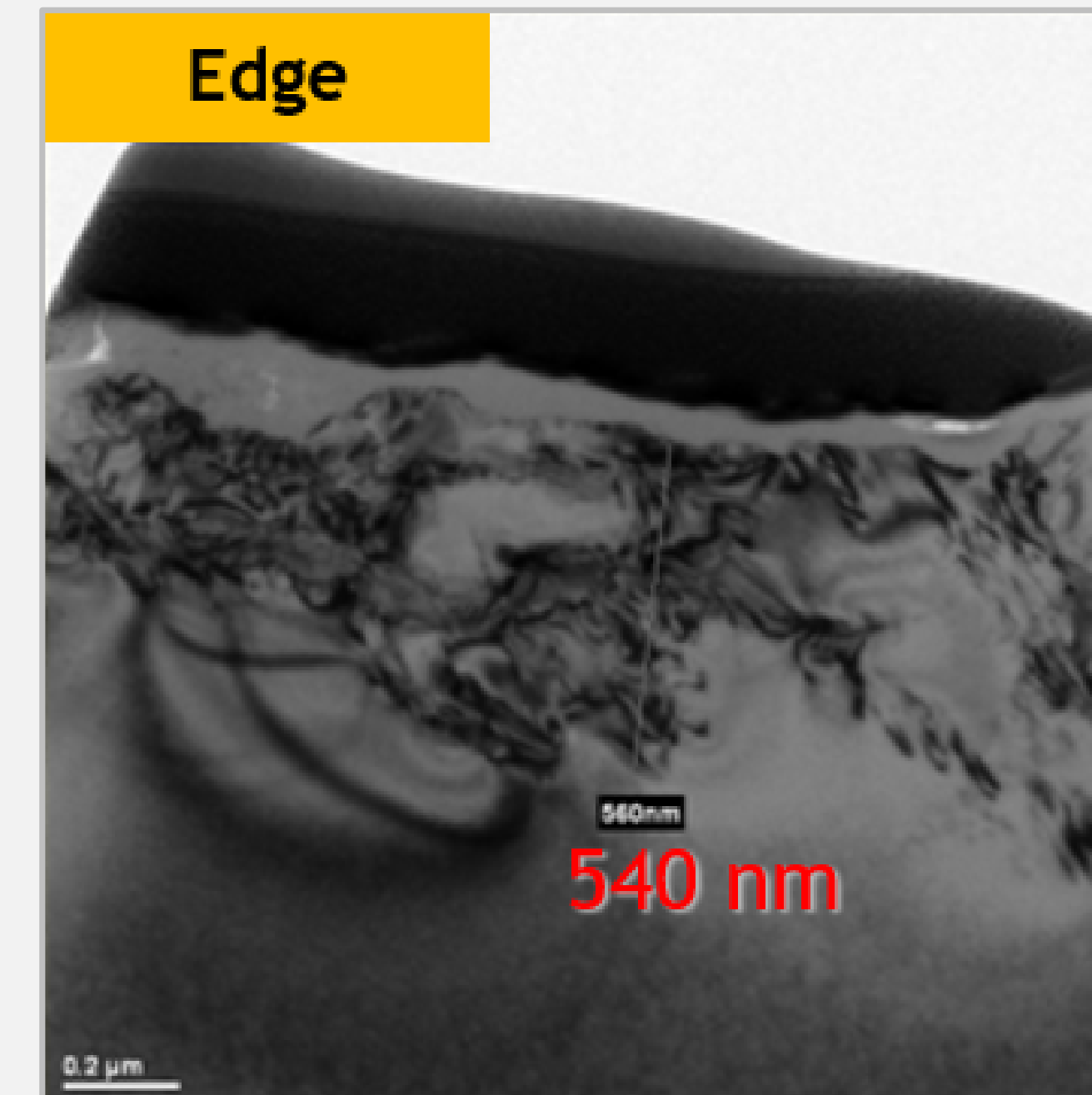
Center



Middle

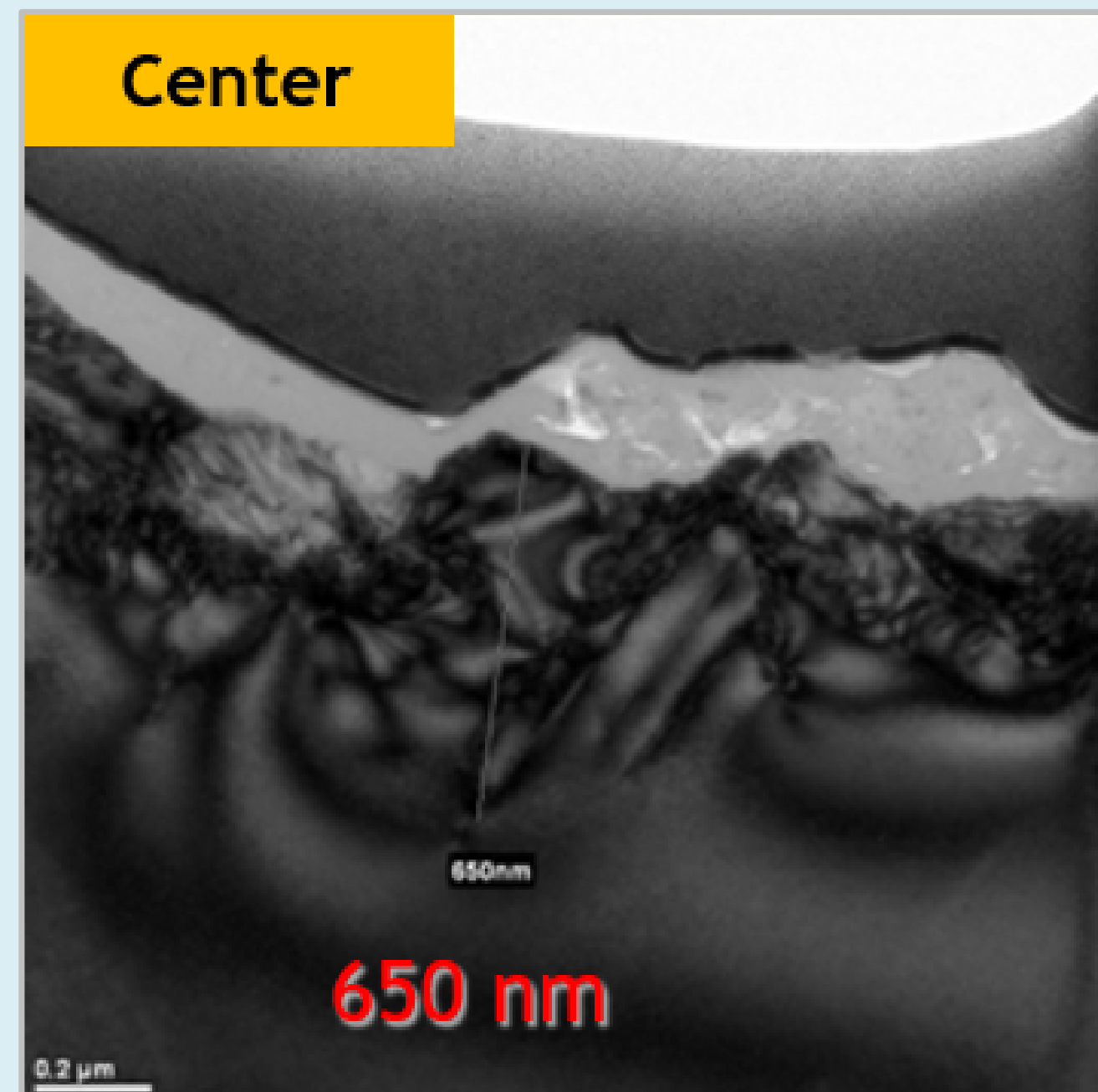


Edge

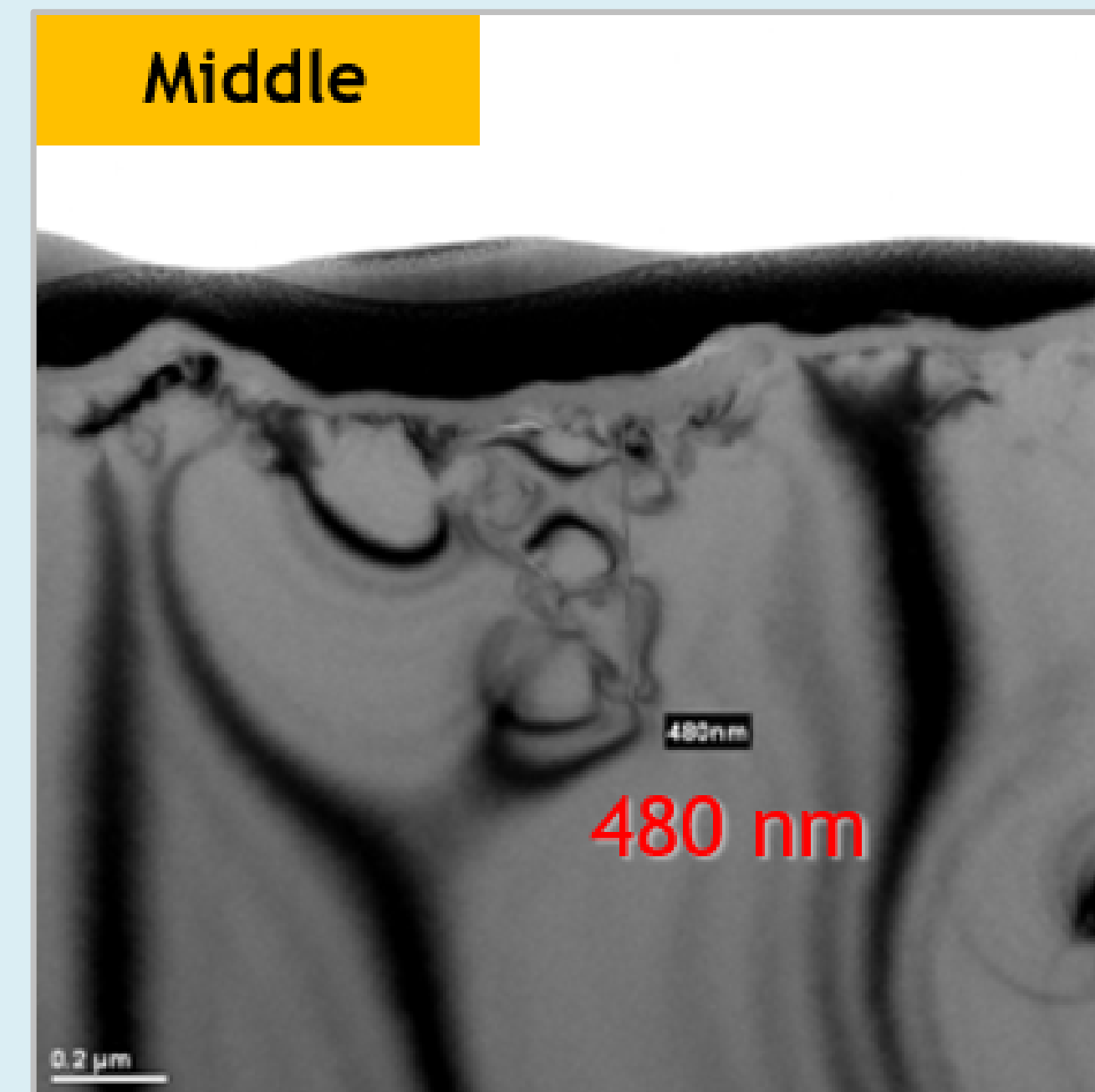


Vitrified #600

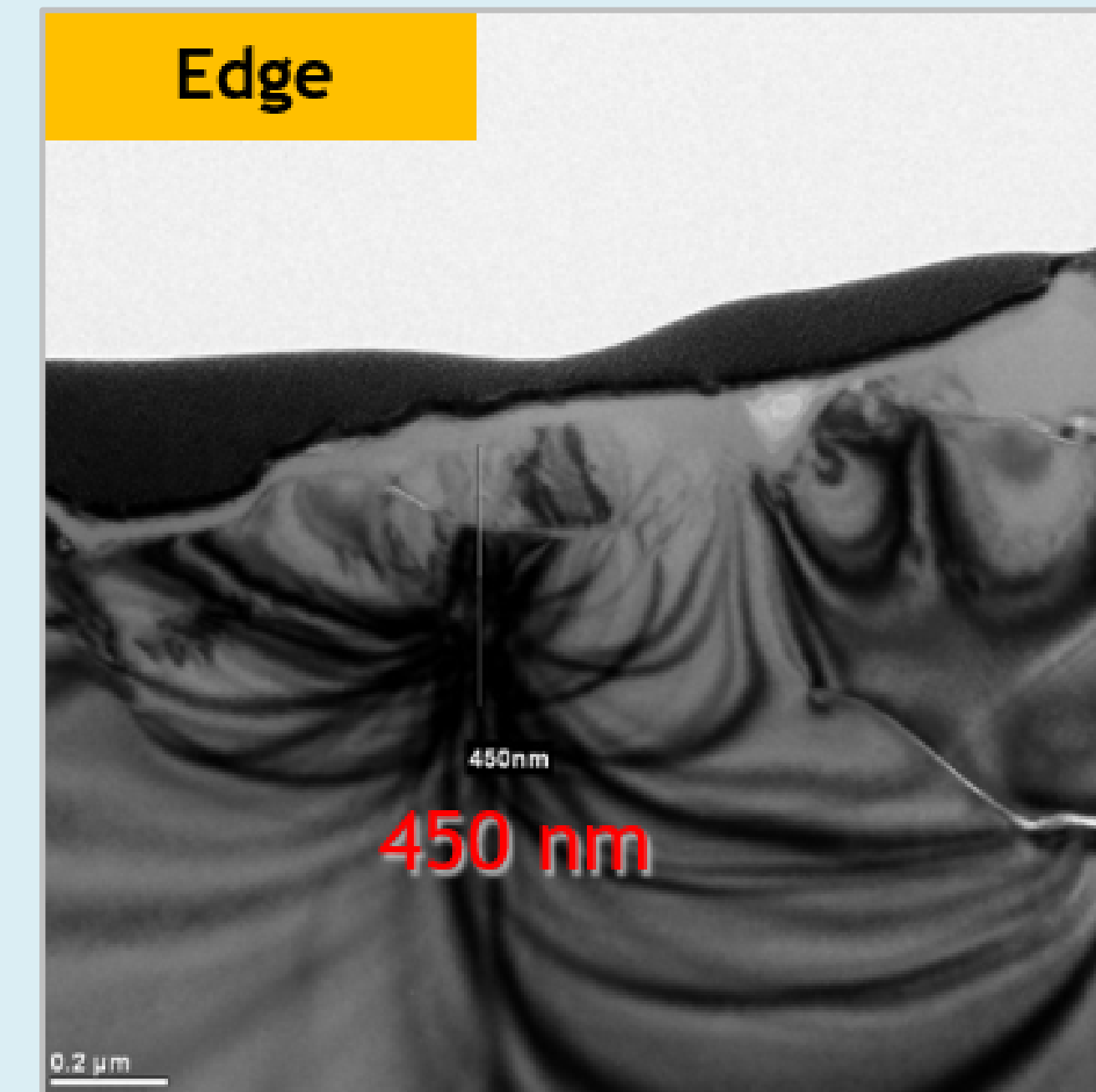
Center



Middle

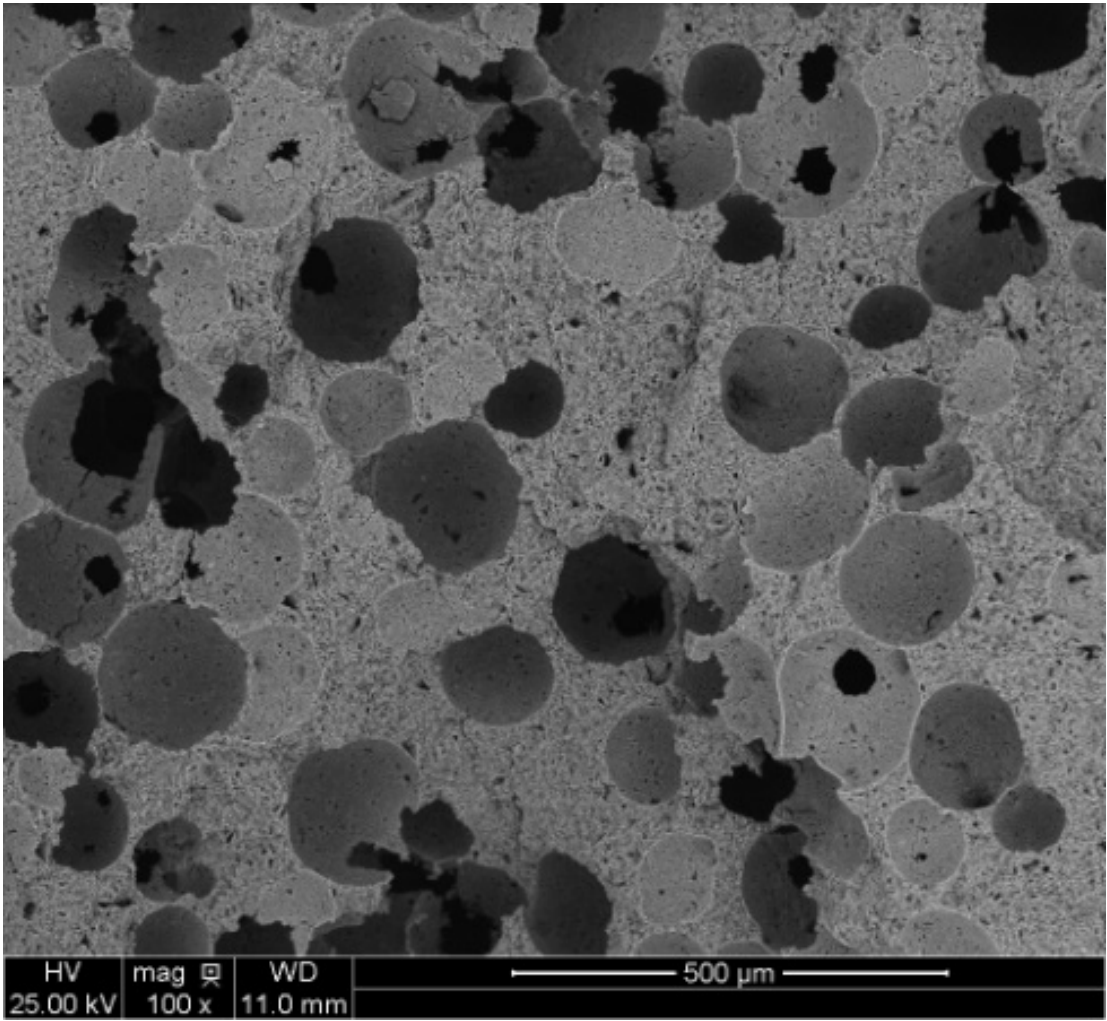
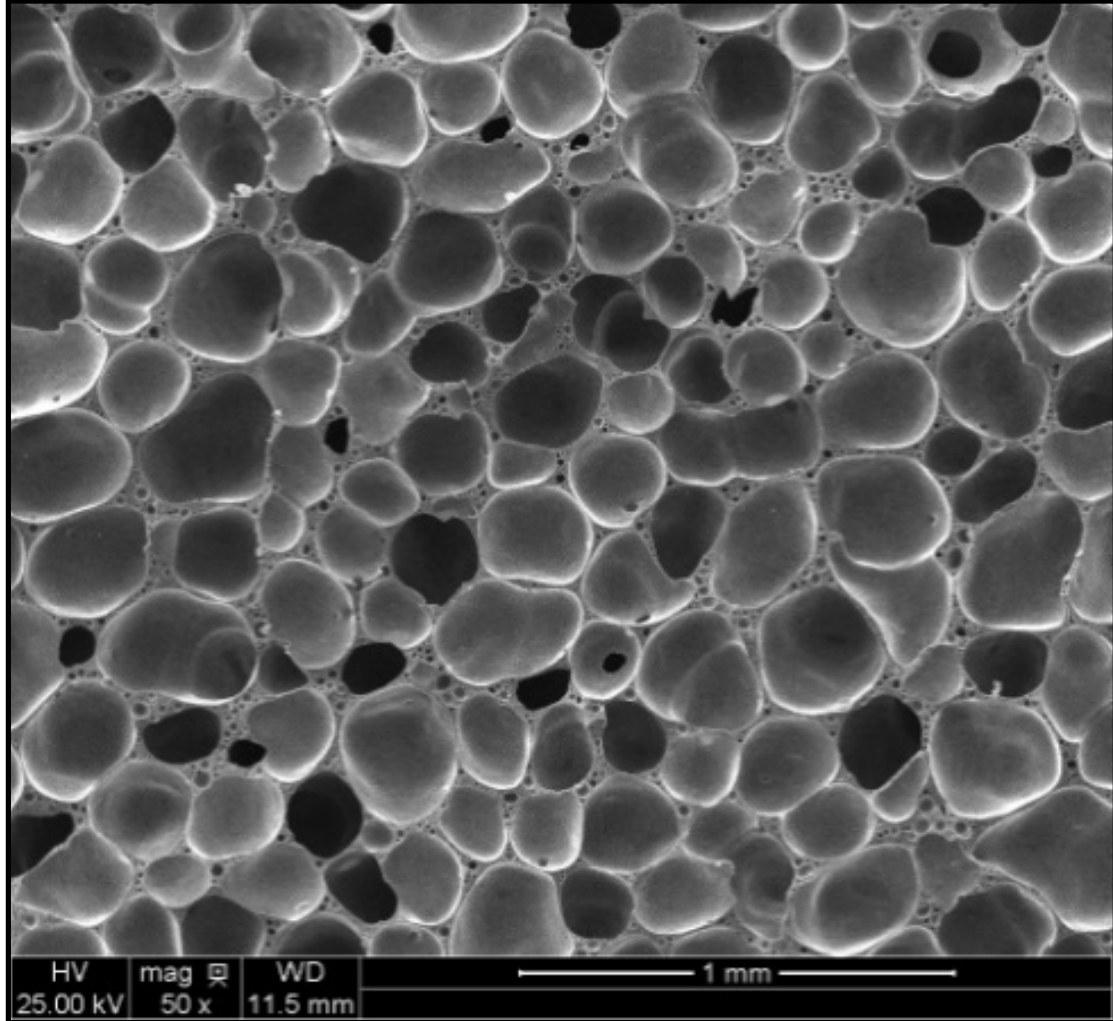


Edge



NANOPOL (VITRIFIED) Si WAFER GRINDING WHEEL

I Z2 Wheel Spec. & Performance (Machine : DGP8761)

Wheel Spec.	NP-D4-303D3.5W10X-5000-VKBT25	NP-D4-303D3.0W7X-8000M-VNPSSR
Grit Size	Mean : ~ 2.0μm, Max : ≤ 5.5μm	Mean : ~ 0.55μm, Max : ≤ 1.2μm
Grinding Current [A]	13.5 A (Feed 0.6μm/sec)	15.5 A (Feed 0.2μm/sec)
Wheel Life [Pcs]	23,000	4,500
Roughness : Wyco Veeco NT9100	Ra : ~ 4.8nm, Rmax : ~ 56nm	Ra : ~ 1.3nm, Rmax : ~ 15nm
SEM [×100]		

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Si Wafer Surface Damage Layer After Z1 Grinding

