SHI-Group Service!

PROTON IMPLANTER

Under development

SERVICE FLOW

TEST IMPLANTATION DESIRED

- CONDITION SELECTION
- SHIPMENT
- IMPLANTATION
- RETURN

EQUIPMENT PURCHASE DESIRED

- SPECIFICATION REVIEW
- SHIPMENT
- START-UP
- AFTER SALES SERVICE

We support you from prototyping to equipment sales！

Unlock New Possibilities in SiC with Proton & Helium Implantation

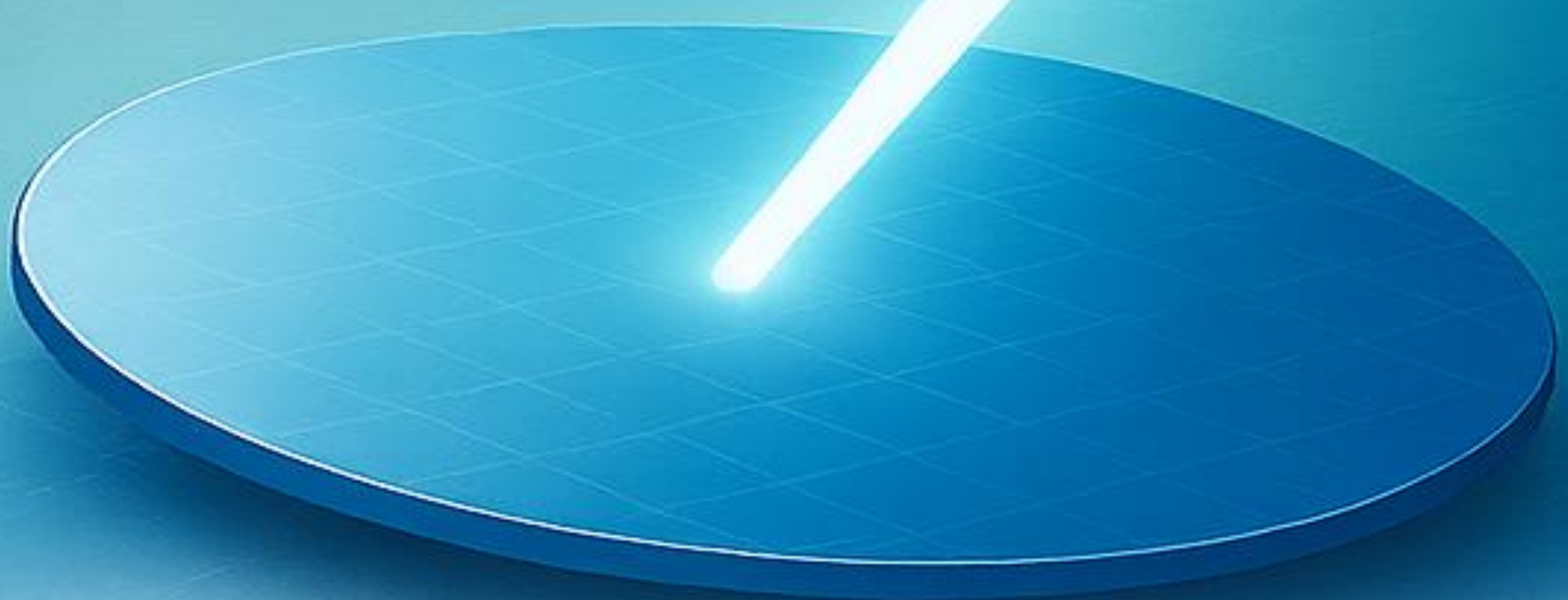
From lifetime control to isolation layers – tailored solutions for your devices

APPLICATIONS

SF-KHII™
Suppresss stacking fault expansion

Lifetime Control
Optimize carrier lifetime for power devices

Isolation Layers
Create precise buried insulating regions



PARAMETER

Parameter	Specification
Energy Range	0.26 – 8 MeV
Ion Depth	0 – 350 μm
Wafer Size Support	6 – 12 inches

WHY CHOOSE US?

Accelerating Energy
From shallow to ultra-deep implantation

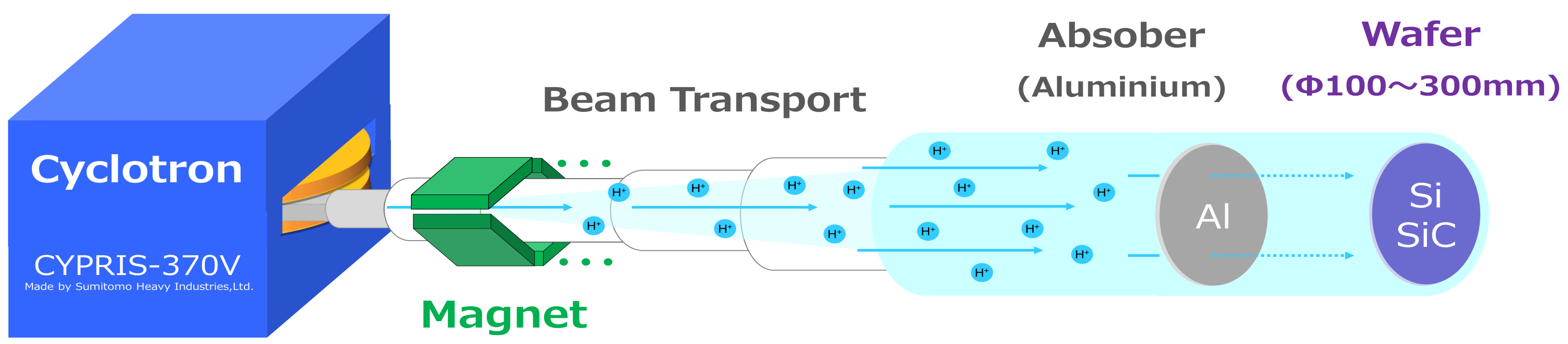
Scalability
Flexible support from prototyping to hig-volume

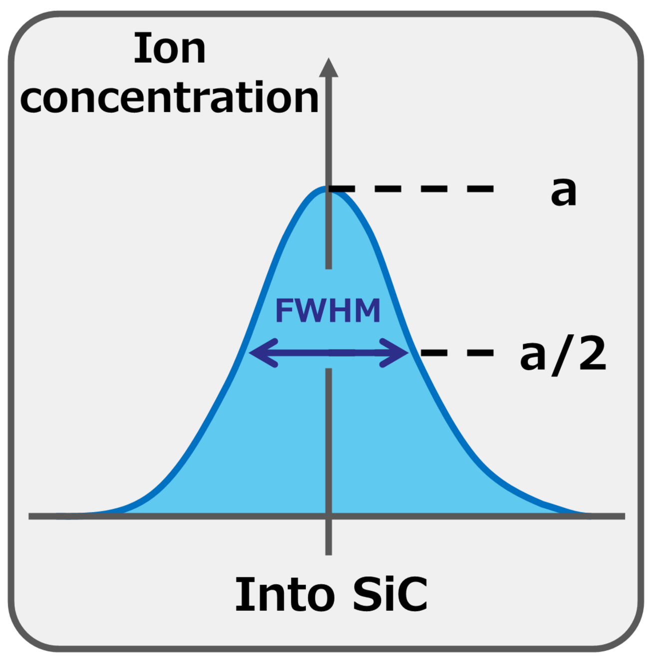
Ion Implantation into Power Devices

Get To Know Us

1. **Contract processing service!**
2. **Implanting proton and helium ions!**
3. **High-energy ion implantation!**

Accelerator Spec.





	Gas	Ion	Energy	Into SiC (μm)	FWHM (μm)
Cyclotron Spec.	Hydrogen	H^+	2MeV	0～29	1
		H^+	4MeV	0～113	4
		H^+	8MeV	0～320	11
	Helium-3	$^3He^{2+}$	23MeV	0～229	4
	Helium-4	$^4He^{2+}$	17MeV	0～114	2
Tandem Spec.	Hydrogen	H^+	0.26～2.40MeV	1.6～43.0	～1.7

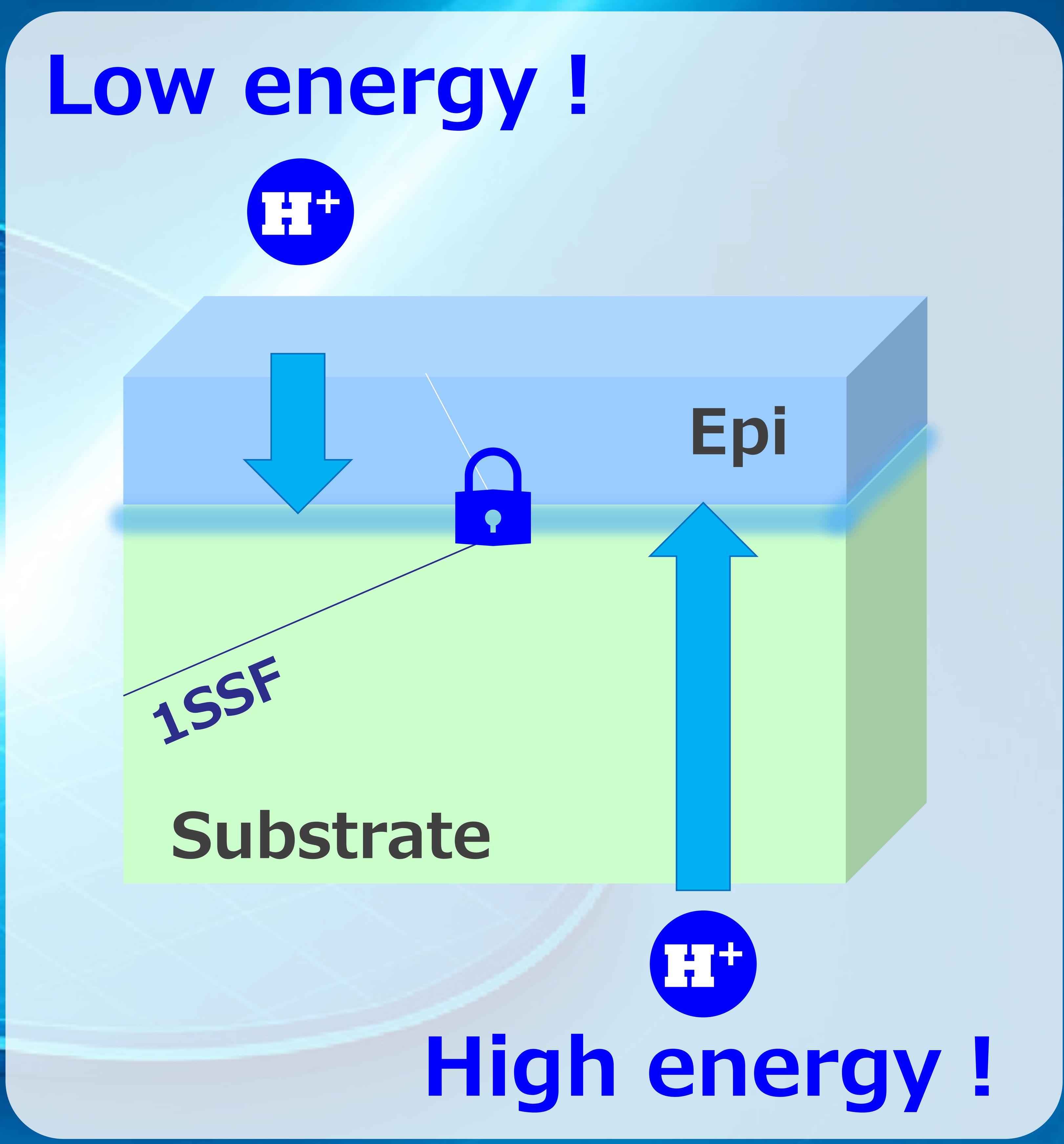
SF-KHII™

Stacking Fault Knocking-down by High-energy Ion Implantation

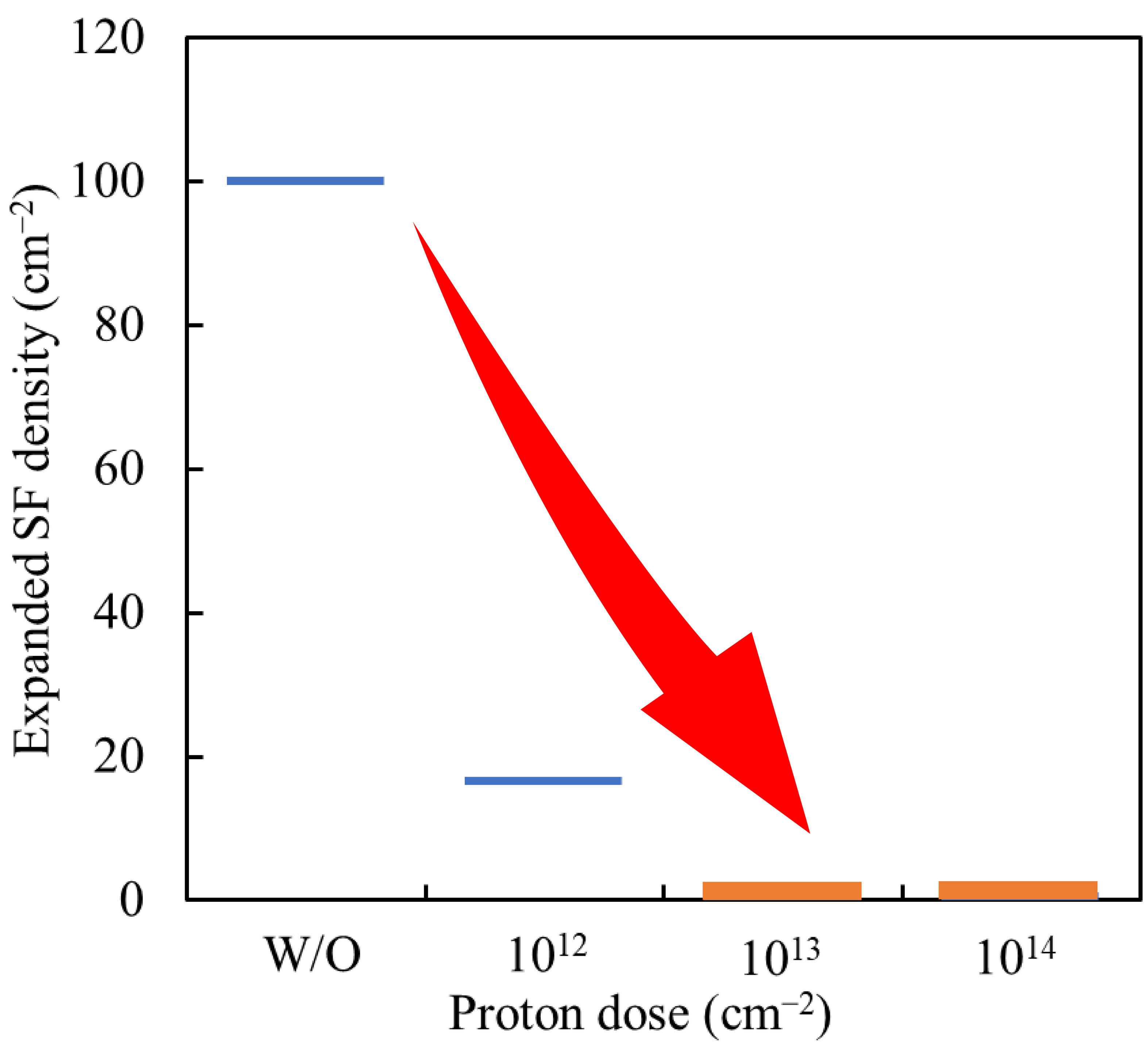
The SiC Reliability Revolution!

☑Ion implantation inhibits defect growth.

☑ Ion implantation is possible from the backside

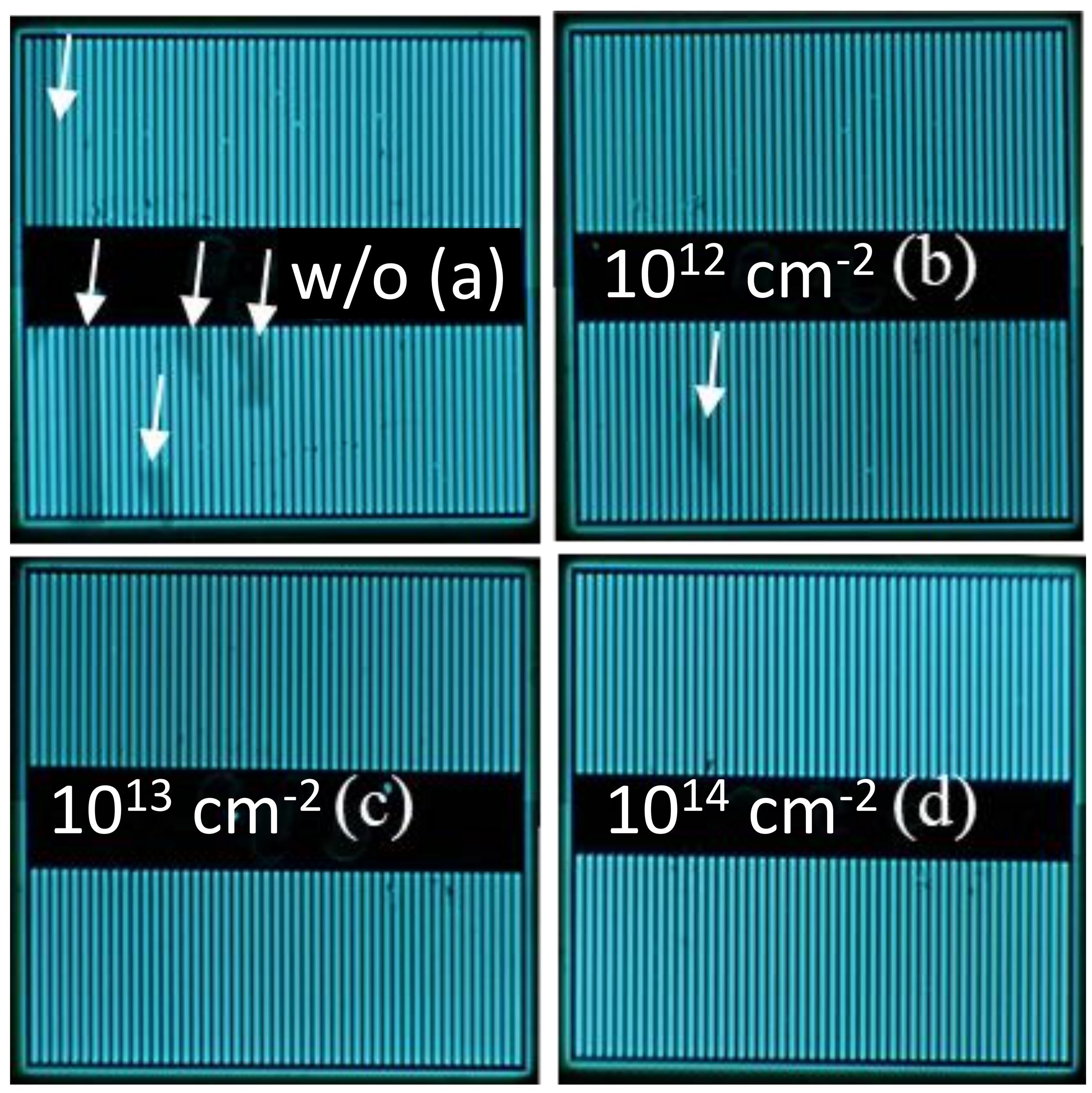


Checking validity



Expanded SF densities for the PiN diodes with and without proton implantation after the electrical stress.

EL images



If the amount of ion implantation is increased, the black shadow will no longer occur.

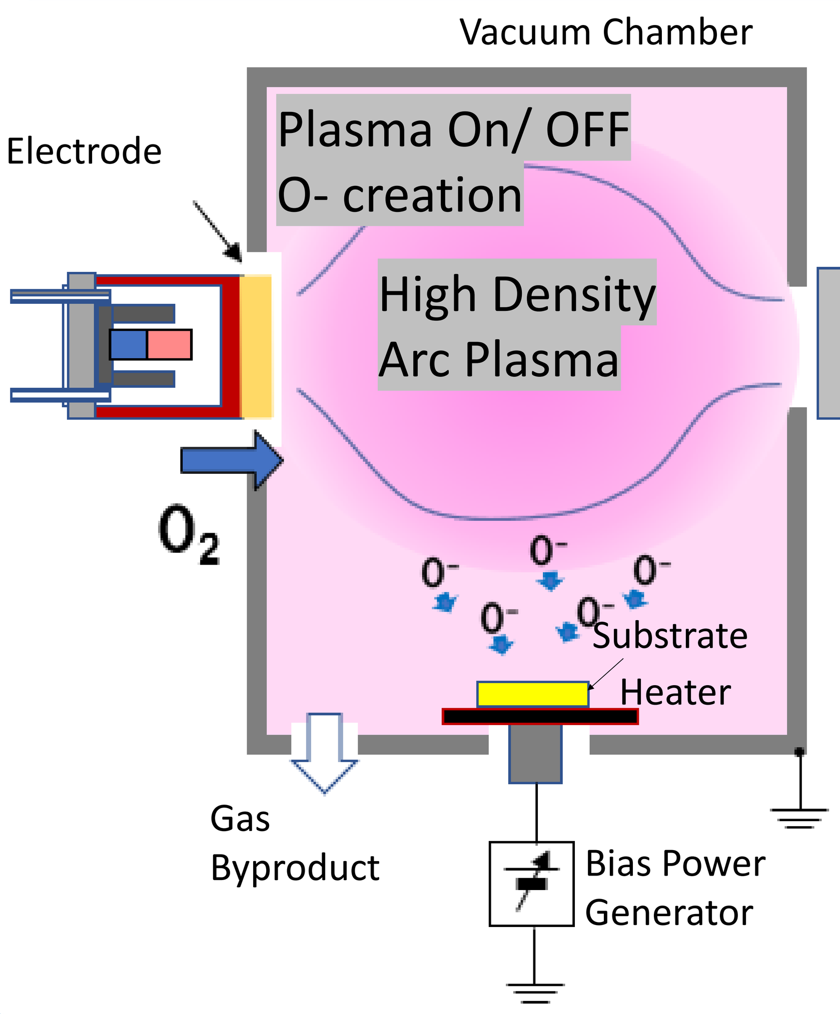
SHI-ATEX

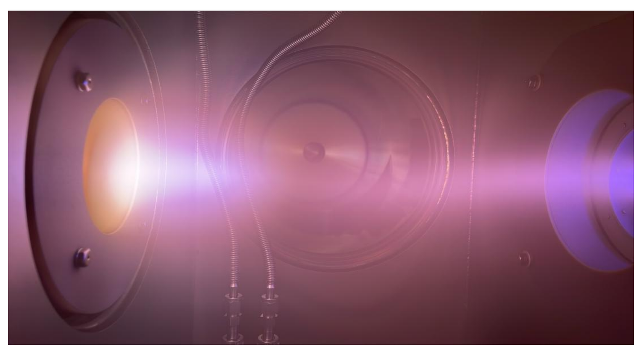
E-mail

Reactive Nion

Negative atomic oxygen (O^-) Ion irradiation equipment

Mechanism of Negative Atomic Oxygen (O^-) Ion Generation and Irradiation





1. High-density negative atomic oxygen (O^-) ion generation by low-pressure arc plasma

✓ Mix of novel technology in generating O^- and the pressure-gradient type plasma generator that can penetrates oxide layers strongly.

2. Highly reactive oxidation treatment by irradiation of negative atomic oxygen (O^-) ion.

✓ High reactivity is due to application of bias voltage.

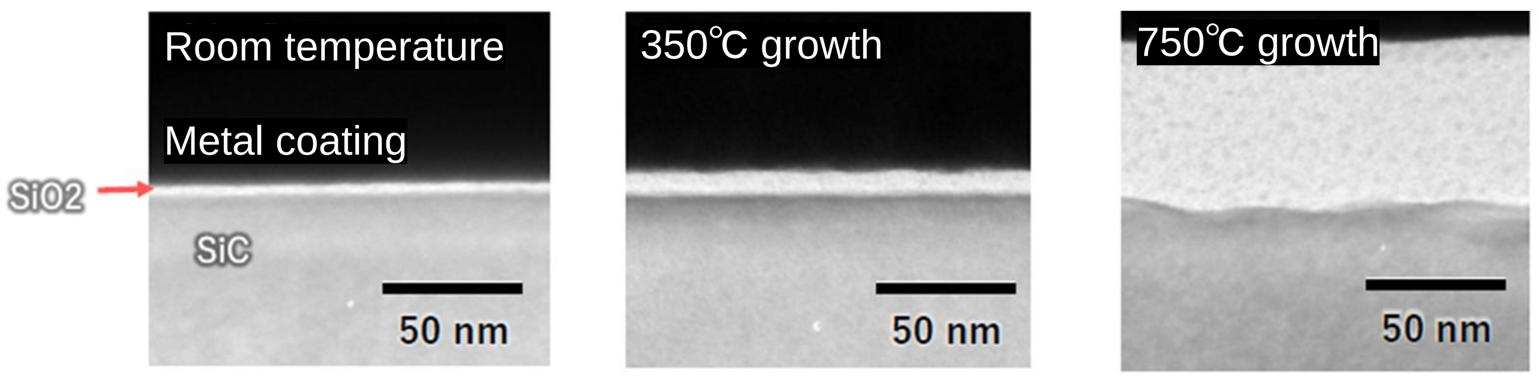
3. Low temperature and no charging treatment

✓ Neutralization reaction is endothermic.

✓ No charging treatment and no other ion source is required.

Low-Temperature Oxidation Treatment of SiC Wafer

From TEM [cross-sections/ oxide layer thickness vs treatment temperature]

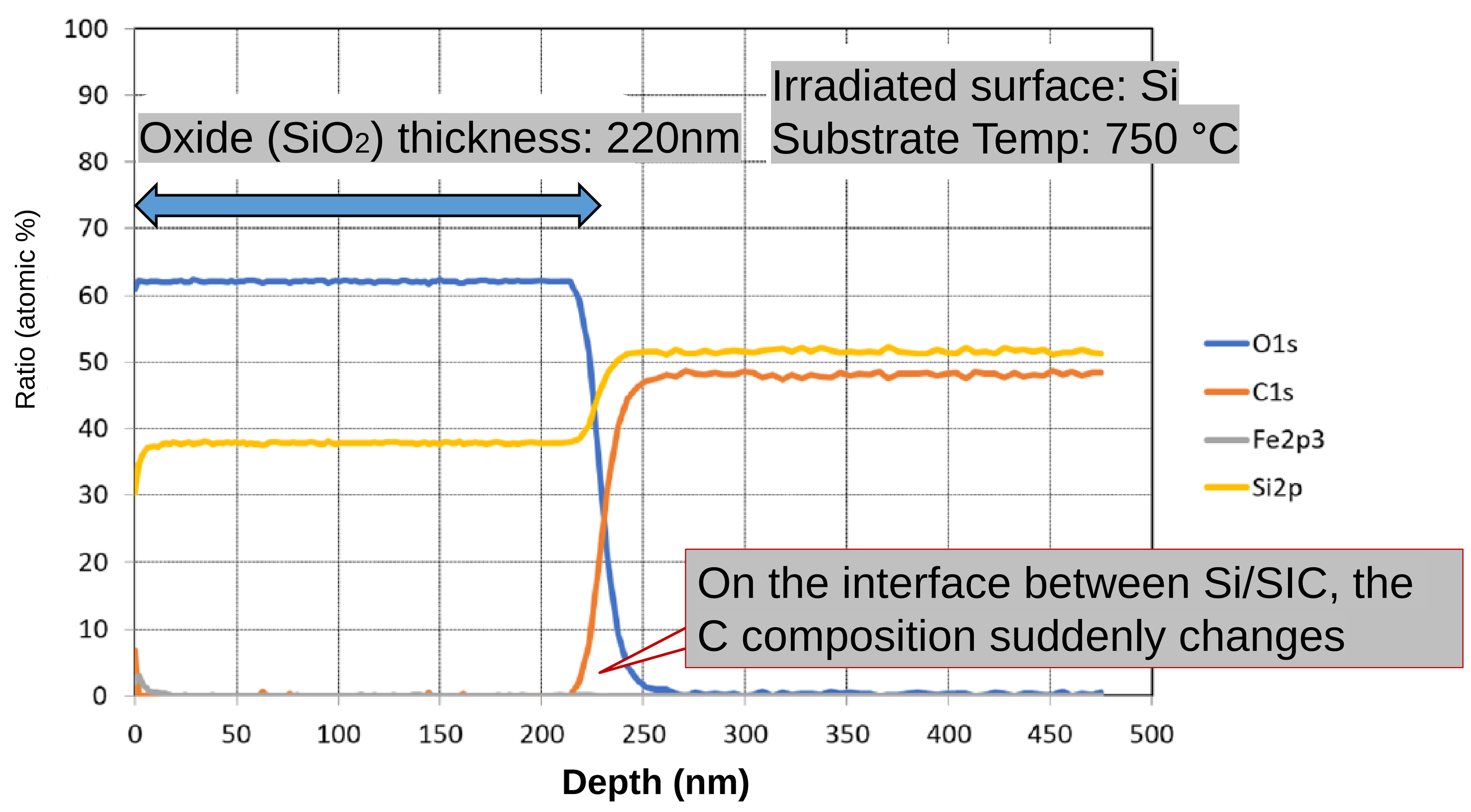


✓ Oxidation of SiC requires heating to more than 900℃.

✓ Irradiation of O^- makes the formation of SiO_2 layer without heating.

✓ At room temperature and 350℃, the interface between SiO_2/SiC is extremely smooth.

From XPS [Depth Profile of the oxide layer]



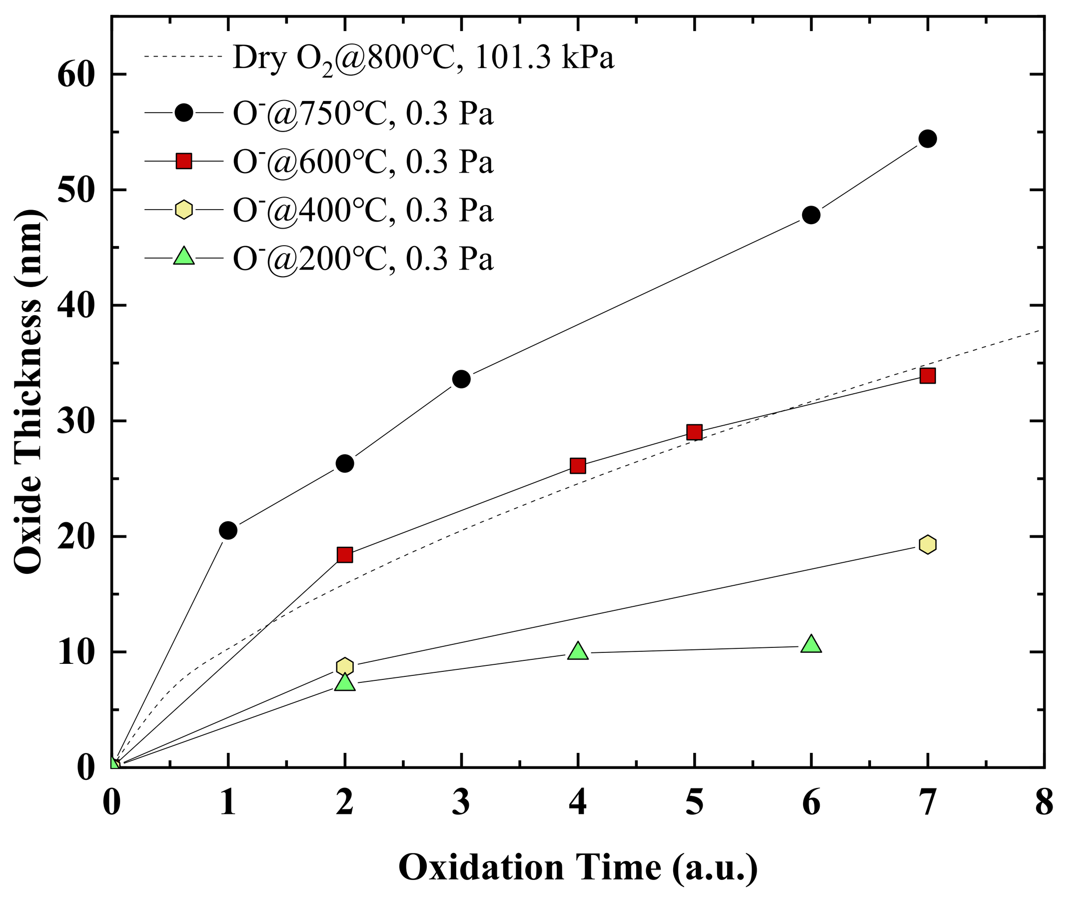
✓ Compared to heat oxidation, the change of the interface between SiO_2/SiC is rapid.

✓ From TEM cross section and depth profile, we can confirm that the smooth interface between SiO_2/SiC was formed (the characteristics are on research).

★Low-Temperature formation of Oxide Layer

★Smooth Interface formed between SiO_2/SiC

Low-Temperature Oxidation Treatment of Si Wafer



*Source: Oxide layer thickness at 800°C of dry oxidation treatment. Uematsu et al, *Hyoumen Kagaku* Vol.23, No. 2, pp. 104-110, 2002. (Japanese lang. only)

★Low Temperature formation of oxide layer.

★Back-End Process (layer formation) is also possible

Specifications	
Substrate size	Up to 8 inch (ϕ200mm)
Substrate temp	Up to 800 ℃
Max. vacuum	Less than 5.0×10^{-5} Pa
Pressure during treatment	Approx. 0.2 ～ 1.0 Pa
Bias voltage	～100 V
Carrier gas	O_2 , Ar (NH_3, CH_4 on research)

Leaflet YouTube

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