

High performance DPF substrate development for upcoming norm BSVII

P20251007-ECMA

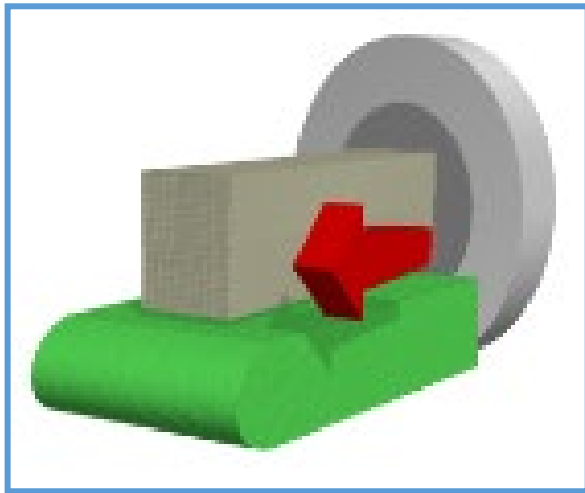
■ IBIDEN DPF : Filter dimension flexibility

Page2/10
2025/10/07

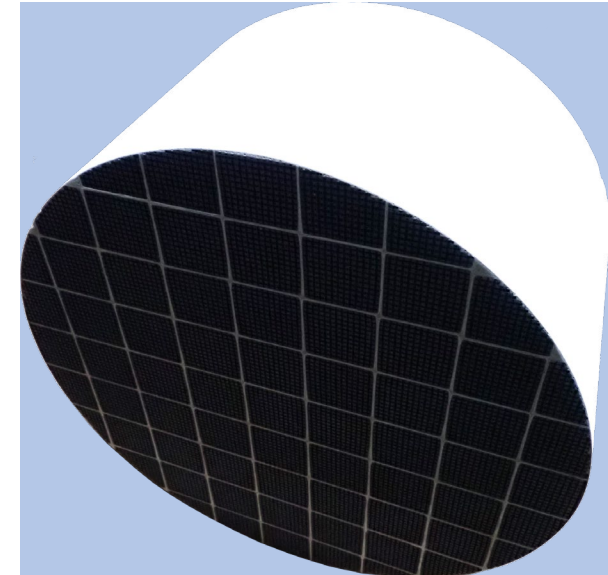
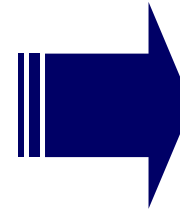
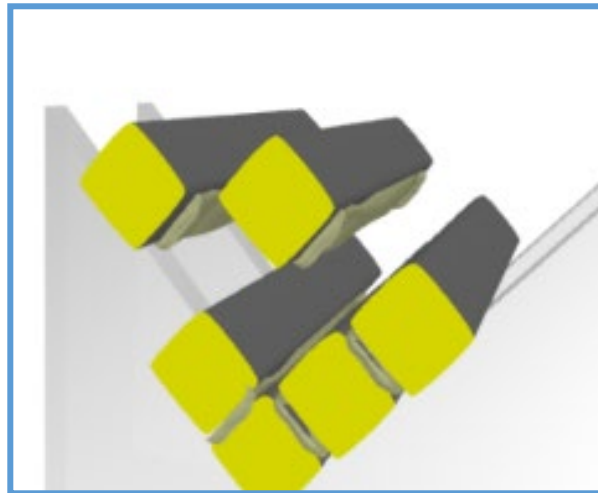


- IBIDEN R-SiC DPF has split-structure assembled with ceramic adhesives.
- It contributes to flexible dimension.

[Extrusion]



[Assembling]



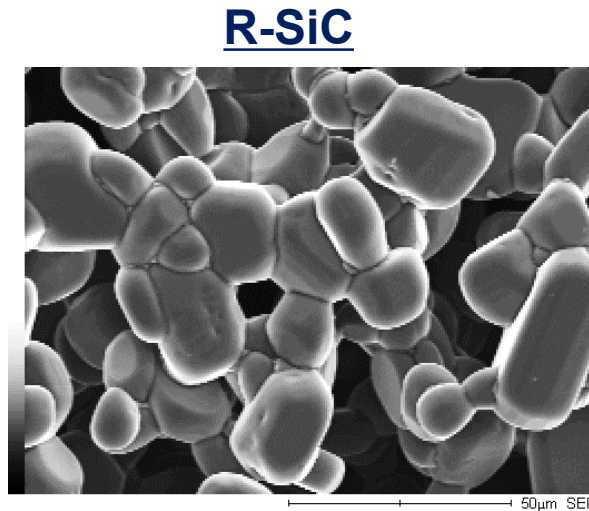
- One extrusion die can be prepared for flexible diameter
- Irregular filter shape is possible

Diameter: $\Phi 100 \sim 330 \text{mm}$

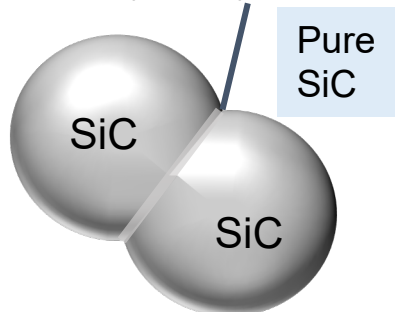
Length: $100 \sim 330 \text{mm}$

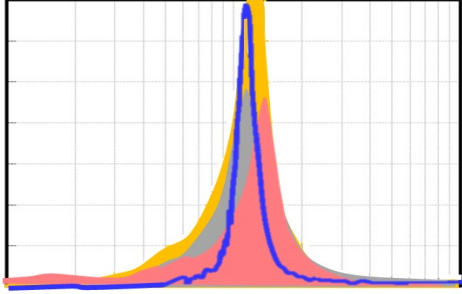
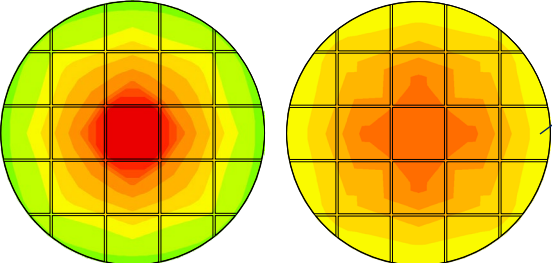
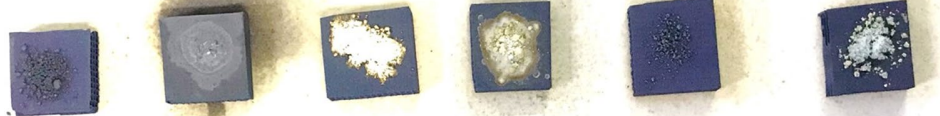
■ IBIDEN DPF : R-SiC characteristic

- IBIDEN R-SiC DPF can contribute high filtration, high thermal resistance and high exhaust gas/ash resistance.



SiC necking
by re-crystalline



Characteristic	Contribute to DPF
Narrow pore distribution	 — :Market cordierite — :Market Si-SiC — :Market AT — :R-SiC High filtration
High thermal conductivity	High  Low  Homogeneous DPF inside temperature High thermal resistance (soot capacity)
High chemical resistance	Fe₂O₃ CuO MgO ZnO Fe₂(SO₄)₃ Ca₃(PO₄)₂  No reaction No reaction No reaction No reaction No reaction No reaction Heat treatment : 1200degC/3hrs High exhaust gas/ash resistance

■ Emission regulation trend

- In European market, emission authorities are requesting tighter emission norms from EUVI to EU7.
- Regarding PN emission, the scope of particle size is shifted from 23nm to 10nm.

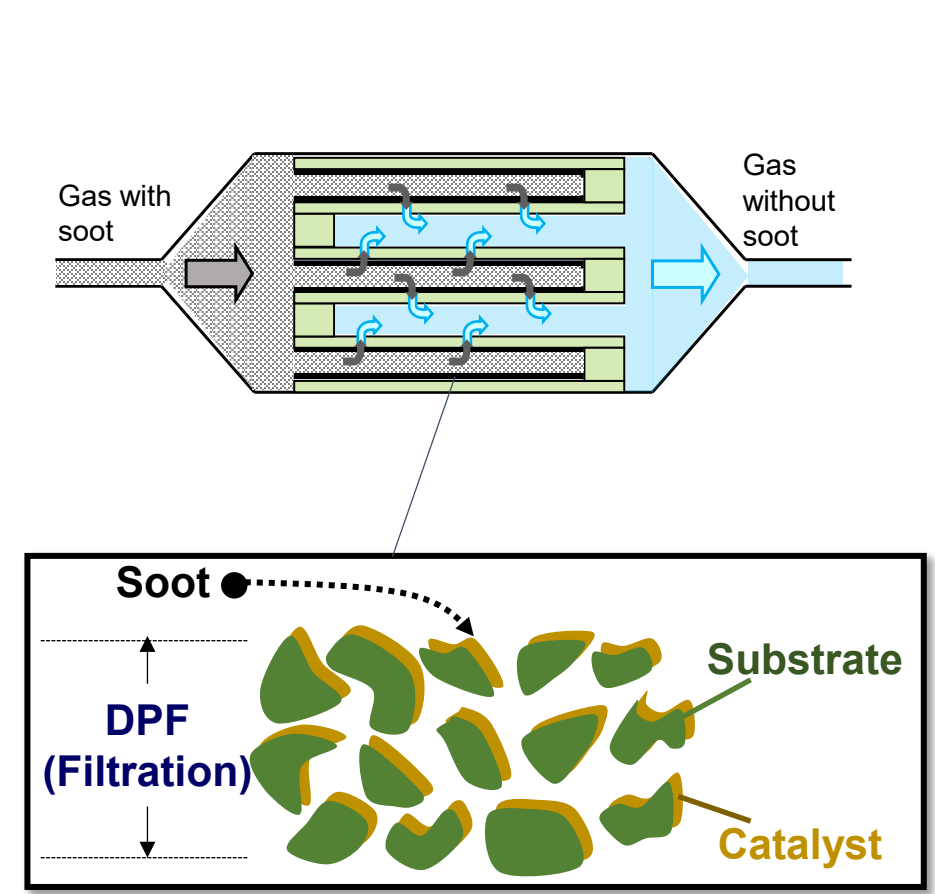
Table. Emission regulation trend

Category	Area	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30
HD	EU	EU VI d/e -PN emission(PEMS/RDE)@23nm -NOx emission@Cold									EU 7 PN >10nm	
	IND	BS VI phase1			BS VI phase2 -PN emission(RDE)@23nm						BSVII?	

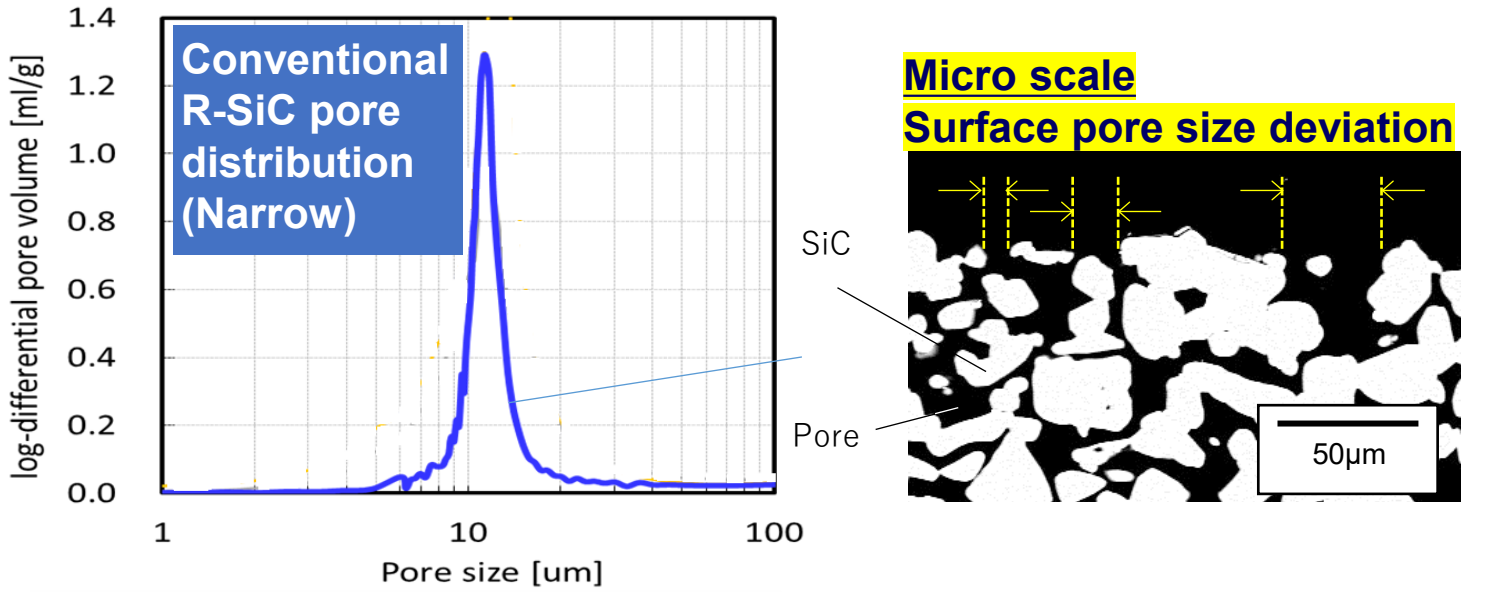
EU7/BSVII? trend	ATS	Feature	DPF requirement
-PN measurement from 10nm instead of 23nm -Tightened NOx (incl. cold start)	Current gen. Next gen.(Estimation) DOC cDPF SCR ➔ SCR DOC cDPF SCR Addition	-PN >10nm increases number +25% -Substrate/coating optimization necessary - Additional NOx after-treatment device to meet tightened NOx regulation	➔ High filtration 1 ➔ Smaller DPF size for SCR space 2

➤ IBIDEN continues to investigate high filtration performance.

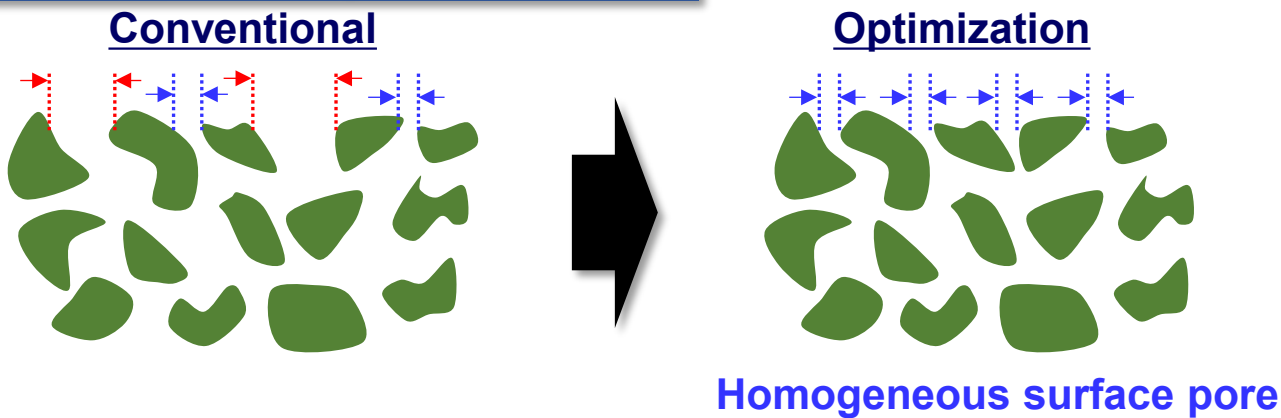
PN/PM filtration by DPF



DPF substrate optimization



Concept for higher filtration



1 Surface pore optimization results

- Surface large pore is optimized for small and more homogeneous distribution.

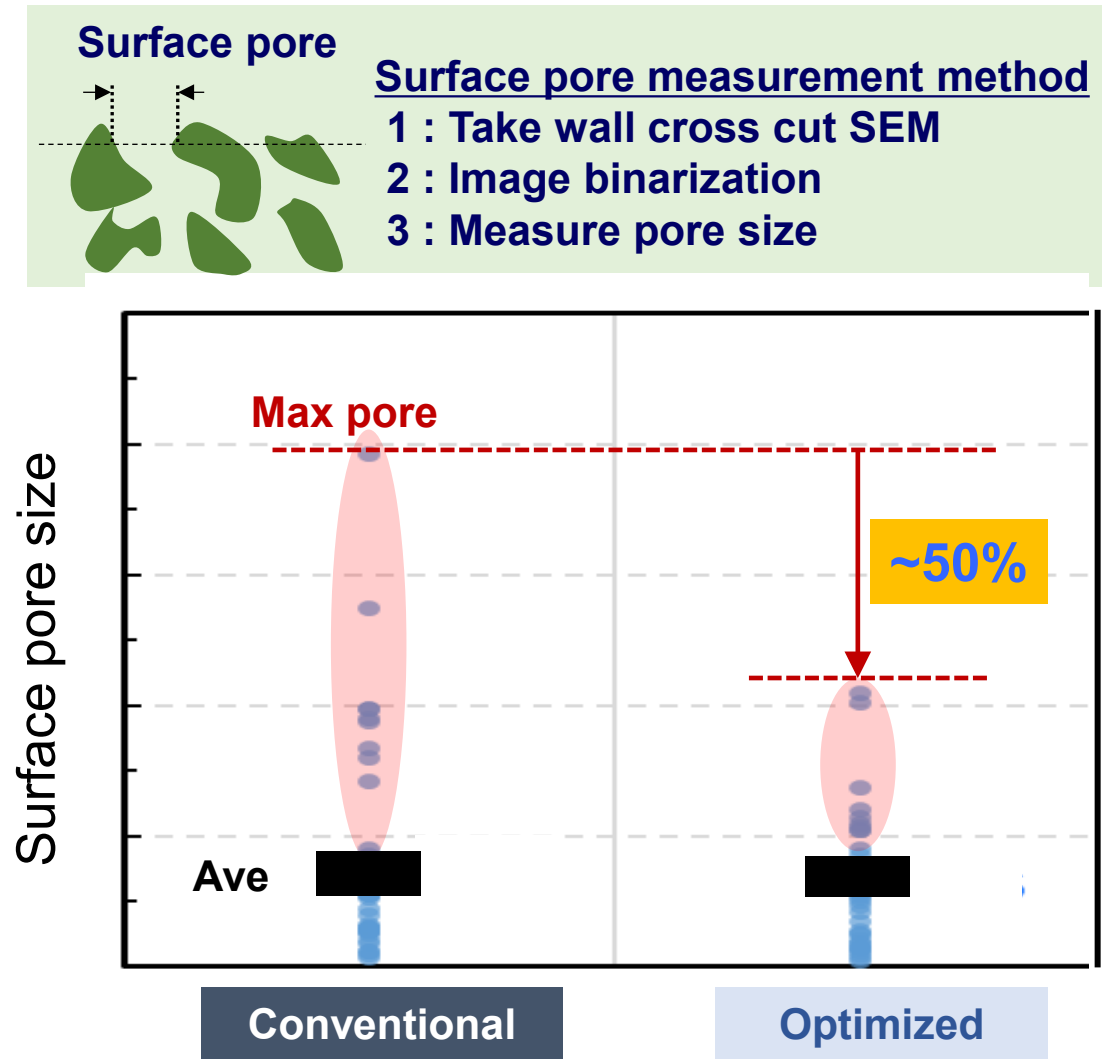


Figure. SEM image of surface pore

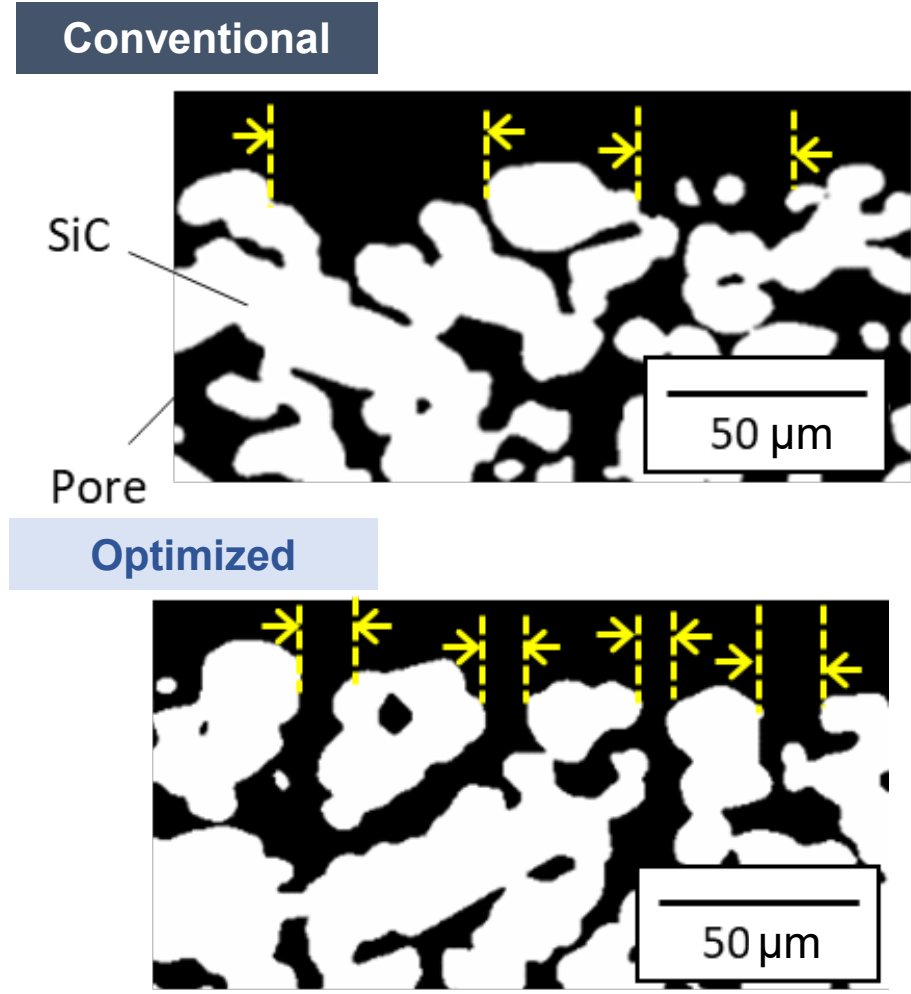


Figure. SEM image of surface pore

- Optimized homogeneous surface pore increases filtration performance.

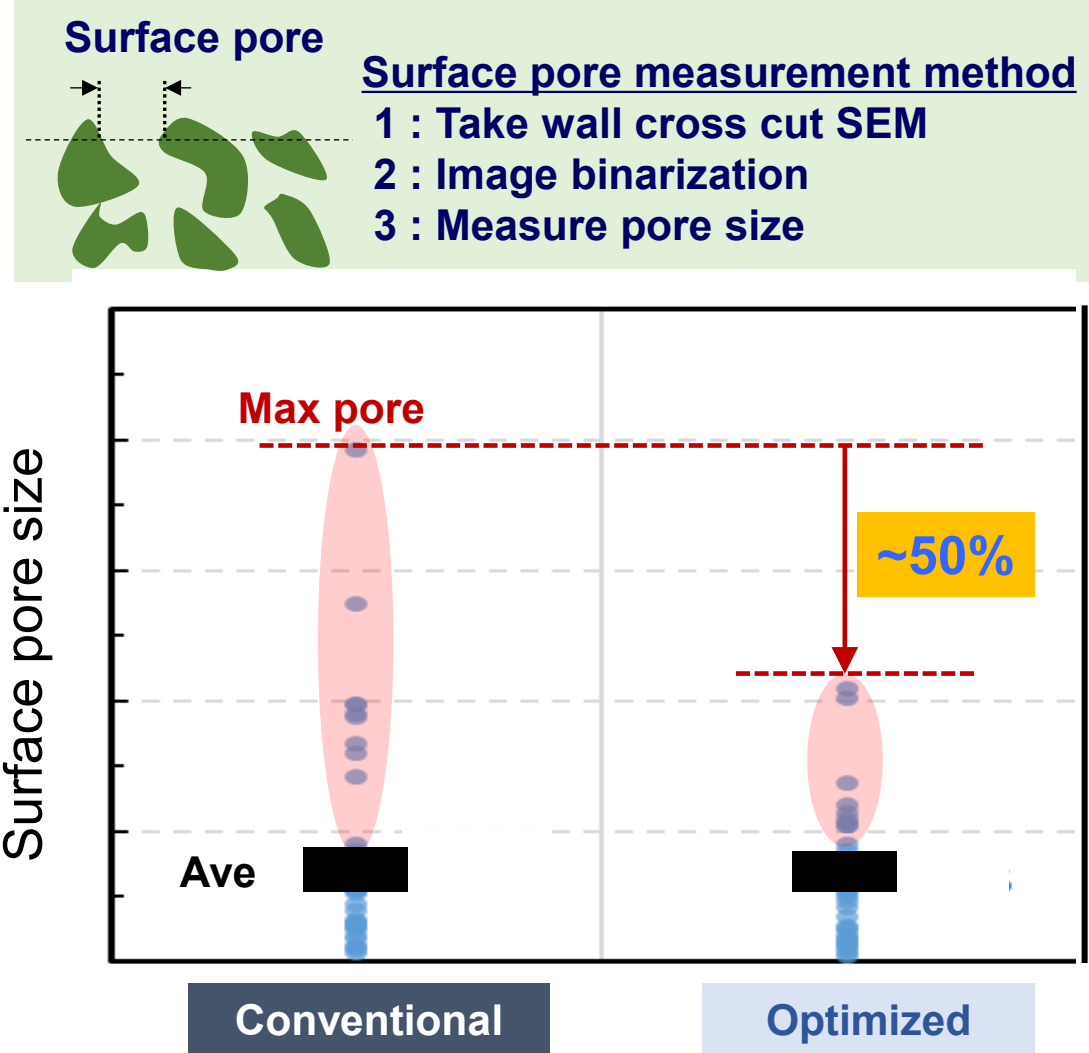
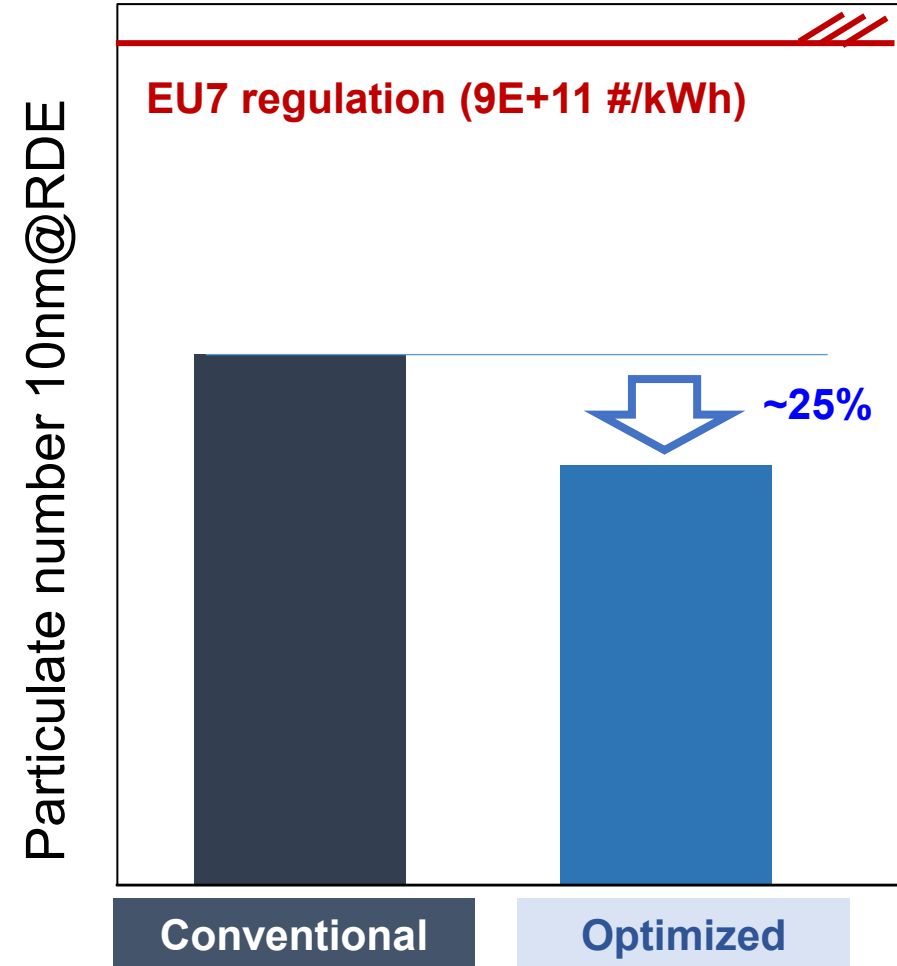


Figure. SEM image of surface pore



- VPL technology can reduce pressure loss at end of life with high ash capacity and filtration area.
- Additionally, it can contribute for ATS design flexibility and DPF length reduction.

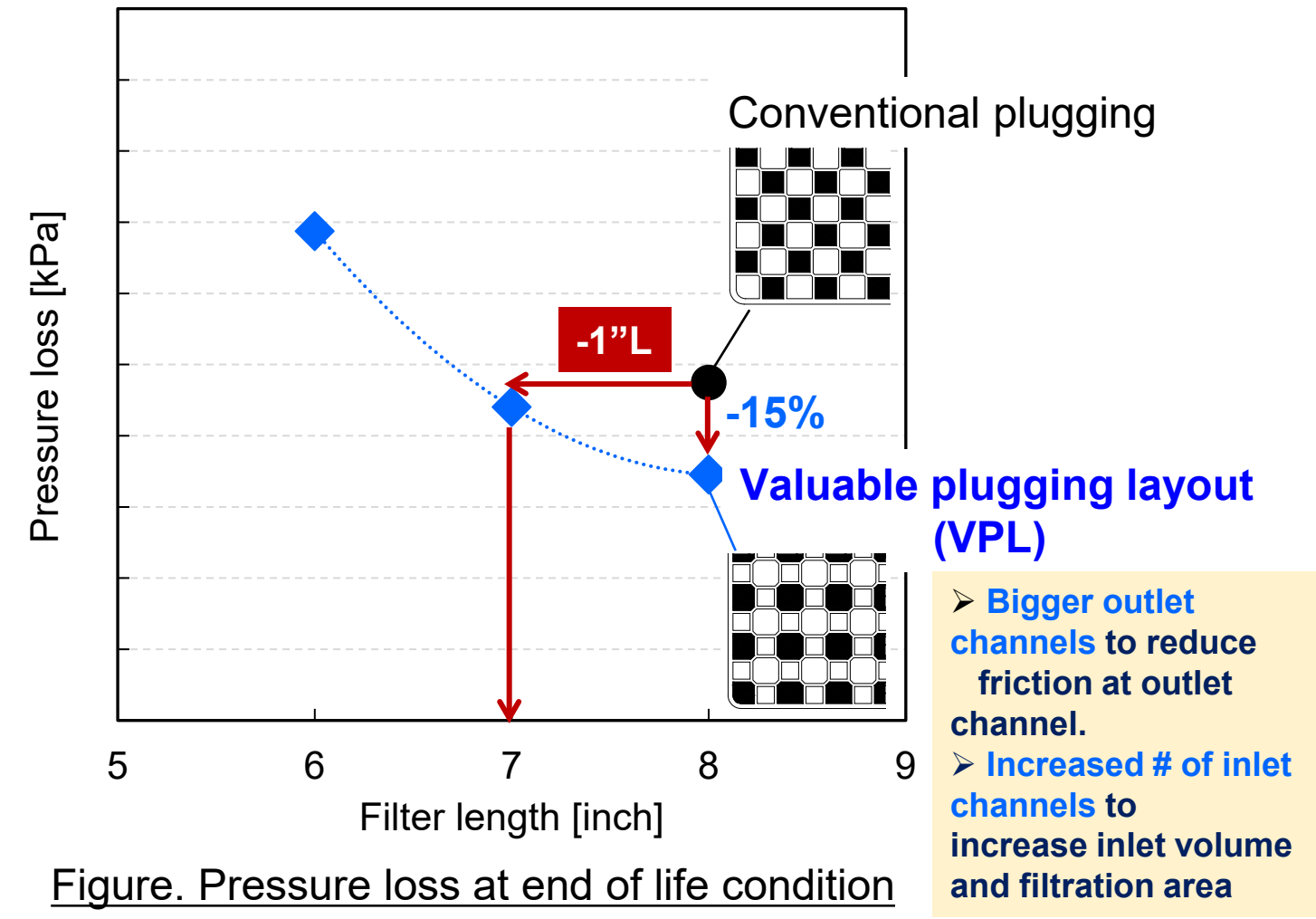
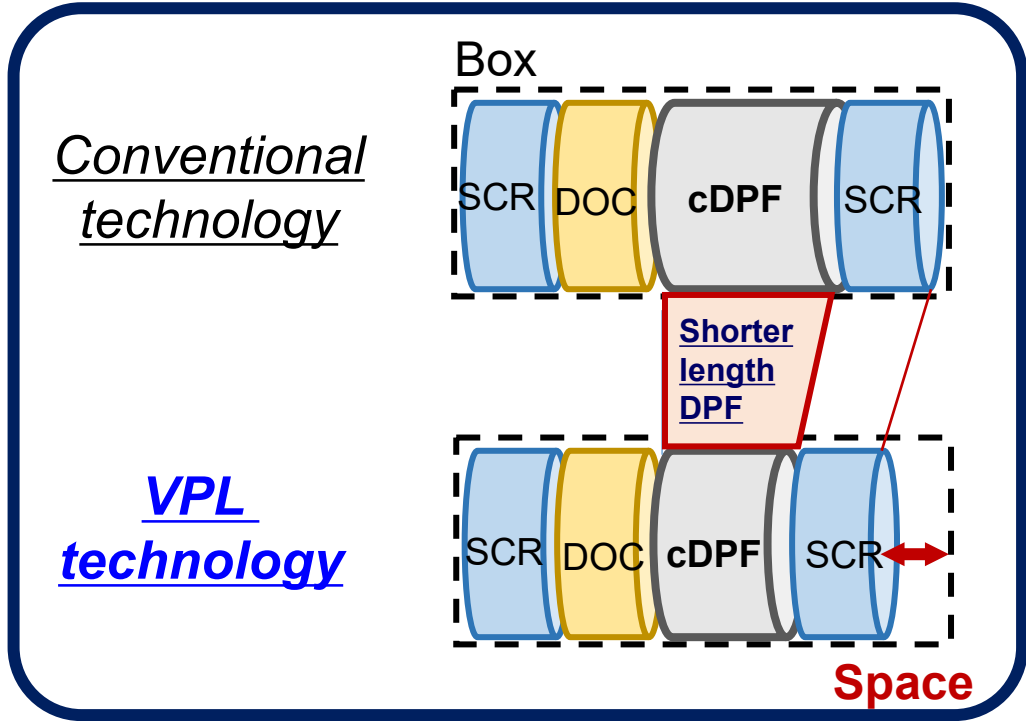


Figure. Pressure loss at end of life condition (soot and ash condition)

Table. OFA and filtration area comparison

Plug layout	Conventional	VPL
OFA [%]	BL	+4%
Filtration Area [cm ² /cm ³]	BL	+24%



Indian: market characteristic

- R-SiC showed lower DPF maximum temperature/gradient during DTI testing against Cordierite due to high thermal conductivity.
- R-SiC which has high soot capacity & can be used for higher robustness in Indian market.

India traffic characteristic

India traffic condition has much traffic jam compared with Europe



Much soot accumulation due to low gas temperature



**High soot capacity
(high soot mass limit) is needed**

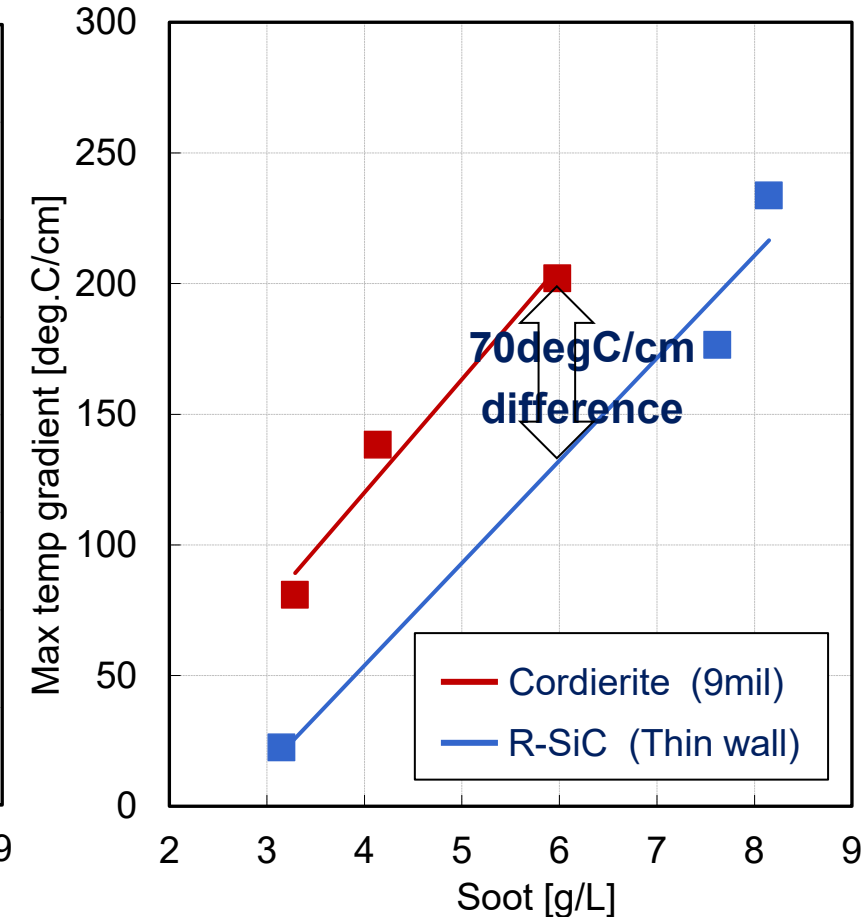
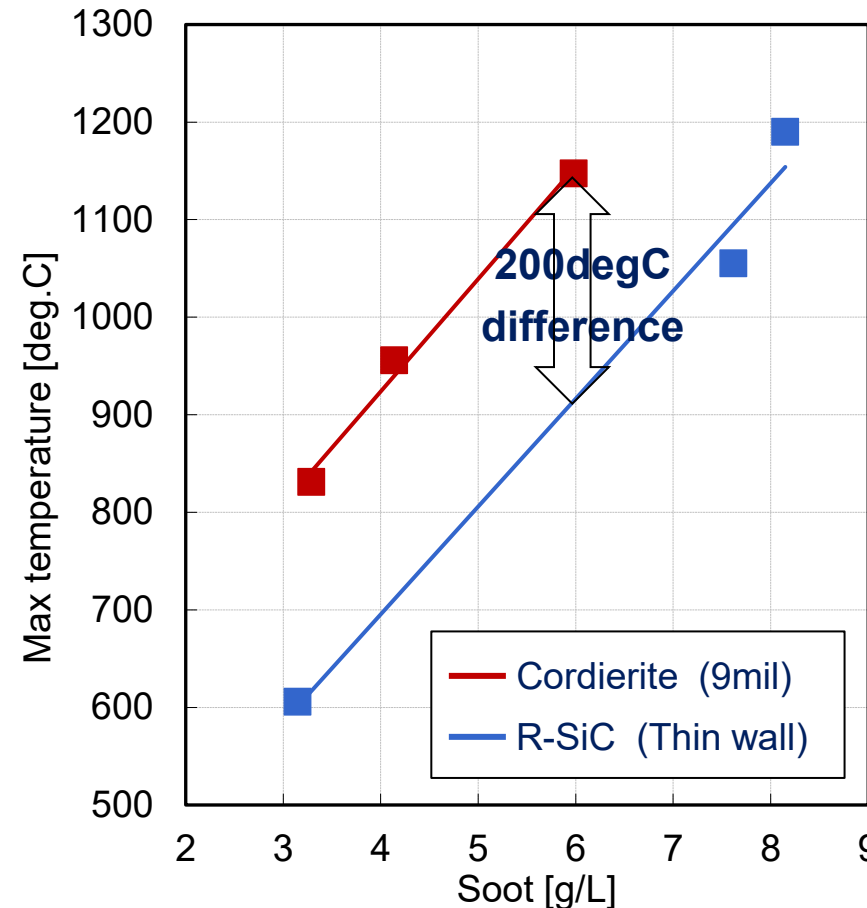
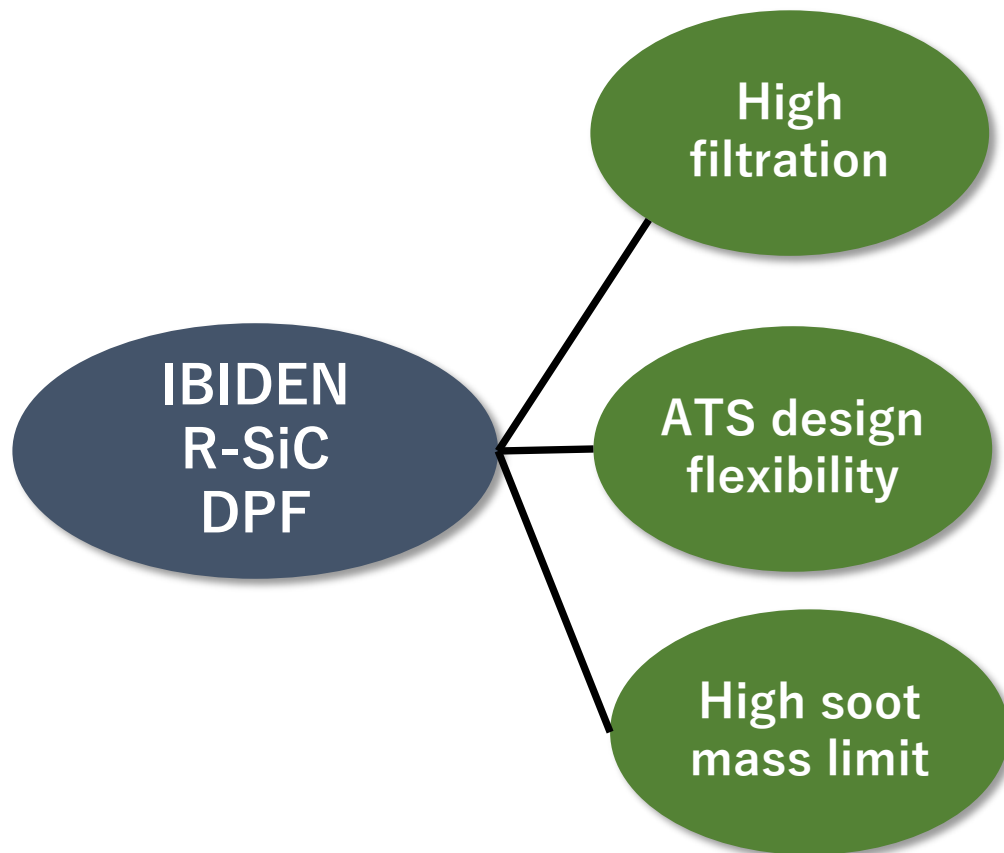


Figure. Maximum temperature and maximum temperature gradient at Drop-to-idle testing

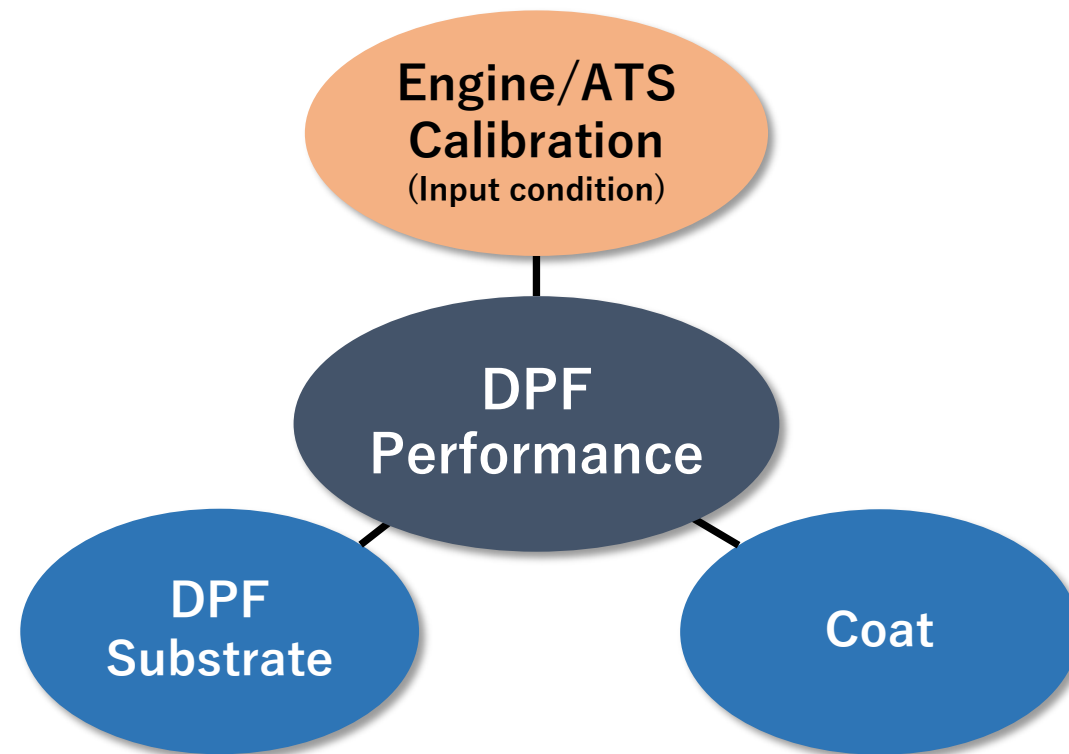
Contribution of IBIDEN R-SiC DPF



IBIDEN continues to investigate increasing filtration performance.

Additionally, IBIDEN R-SiC DPF contributes to ATS design flexibility due to VPL technology and safety using in India market due to high soot capacity.

Collaboration with supply chain



*DPF performance relates DPF input condition, DPF substrate and coating.
→ Hope to develop it with good communication*