

Micropole system Re/W filament
Re/W filament Application

1 Concept

Re/W type sensor filament is available, in order to run Micropole System under the condition of halogen species for CVD and Etching process.

	Y₂O₃ / Ir	Re / W
○	H₂O, O₂	Halogen compounds
×	Halogen compounds	H₂O, O₂
	For PVD tool	For CVD, Etching tool

2 Application

- ① <CVD> Pre/Post Si CVD process, tool status check after cleaning process
- ② <CVD> Residual nitrogen check before SiC-CVD process
- ③ <Etch> Investigation for etching rate variation in every process batch

3 Sensor durability data

4 Point to notice

Micropole system Application

PECVD process system check

Pre/Post process run, residual gas check in high vacuum condition after the cleaning

Process Gas

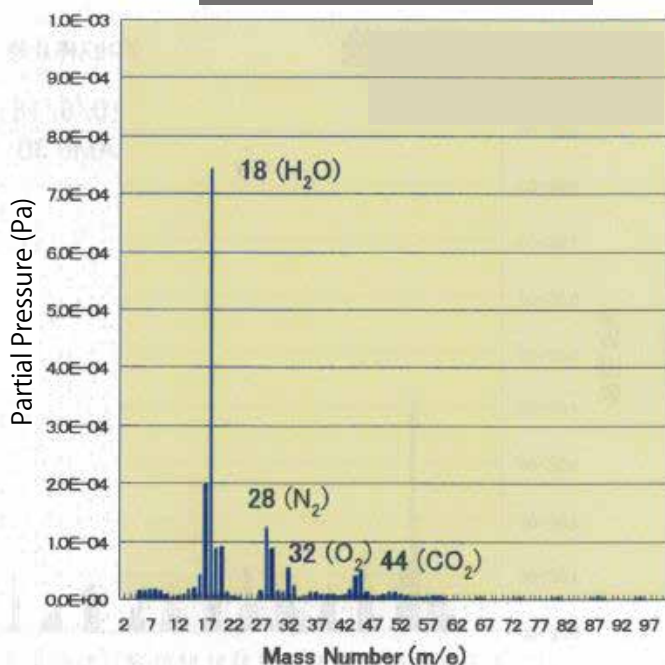
■ **CVD Process** $\text{SiH}_4 \rightarrow \text{Si} + 2\text{H}_2$ (Hydrogen plasma)

■ **Cleaning Process** $\text{Si} + 4\text{F} \rightarrow \text{SiF}_4$ (NF_3 in Ar plasma)

Benefits for customer

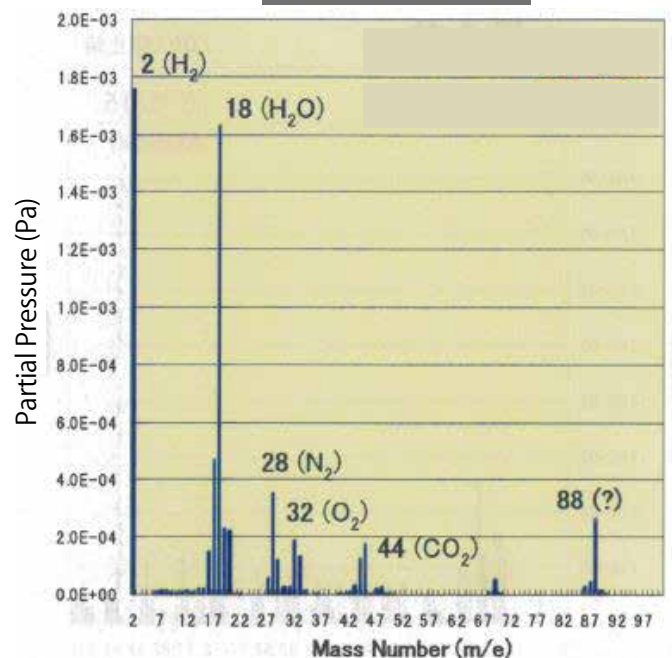
- Monitor the change of residual impurities (water, oxygen) after tool PM (exposed to ATM). Efficiency of the recovery work
- Optimization for daily maintenance period of the tool condition.
- Advanced problem notification from tool condition change. Preventive detection.

Before process start



Detected mass spectrum
m/e=18, 28, 32, 44

After process



Detected mass spectrum
m/e=2, 18, 28, 32, 44, 88

Micropole system Application

SiC CVD Process running condition check

Residual gas monitoring in high vacuum before deposition process

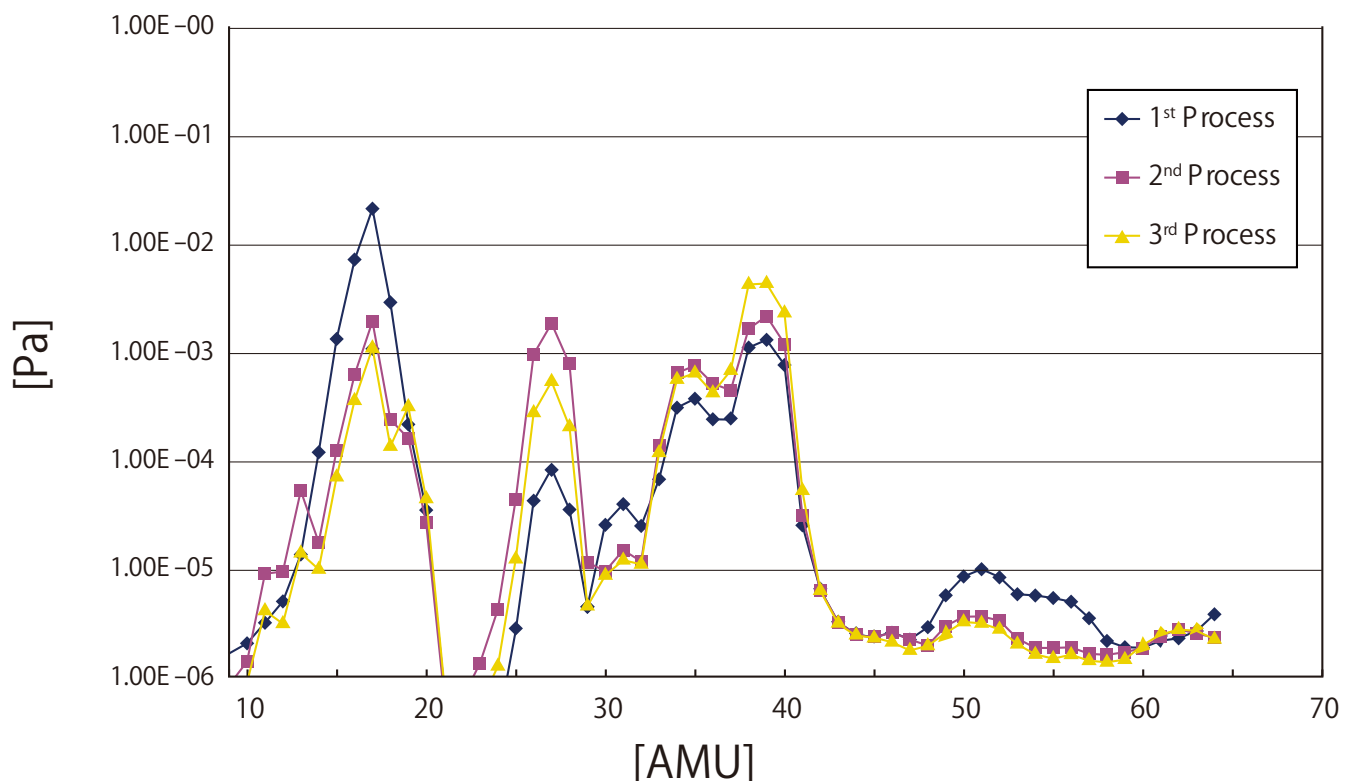
Process Gas

■ $\text{SiH}_2\text{Cl}_2 + \text{C}_3\text{H}_8$

Benefits for customer

- Since nitrogen is used as n type dopant for the SiC epilayer formation, residual nitrogen concentration needs to be reduced.
- Micropole system contributes to quality control by checking residual nitrogen in the chamber before process run.

Reference Data



Micropole system Application

Troubleshooting

Monitor the etching rate variation for run to run after cleaning in checking residual gas in vacuum before process run.

Process Gas

■ Ar, He, Cl₂, O₂, BCl₃, CH₄

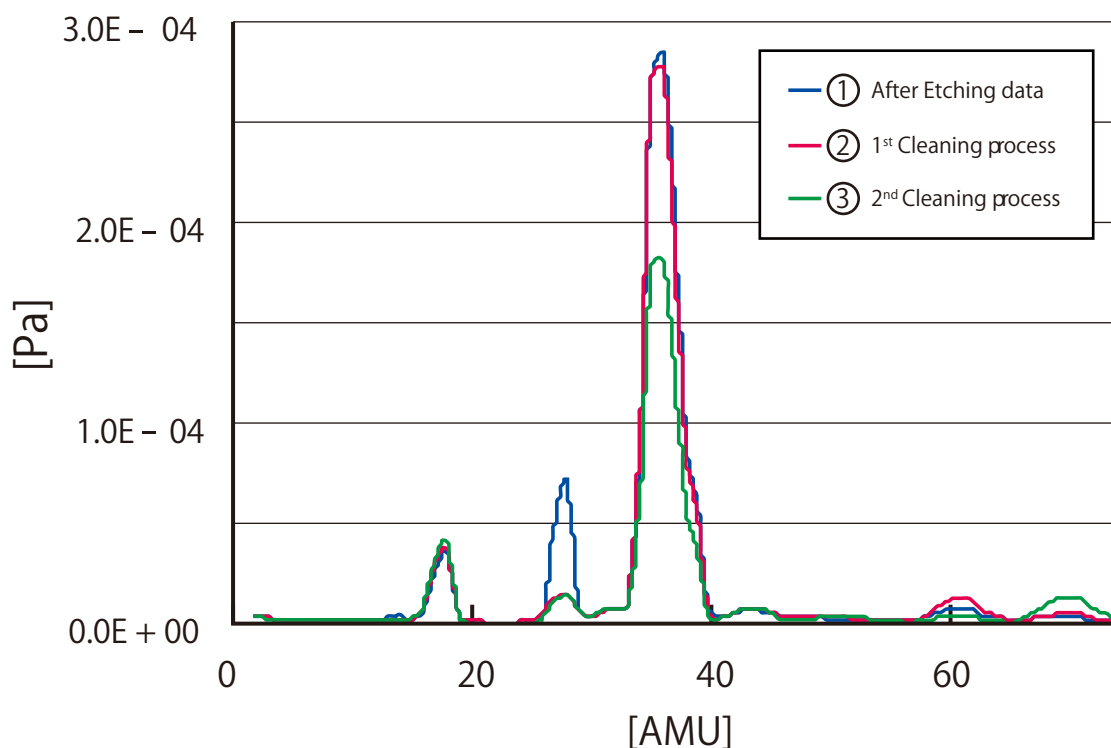
Benefits for customer

■ **Problem** : Etching rate variation per process batch

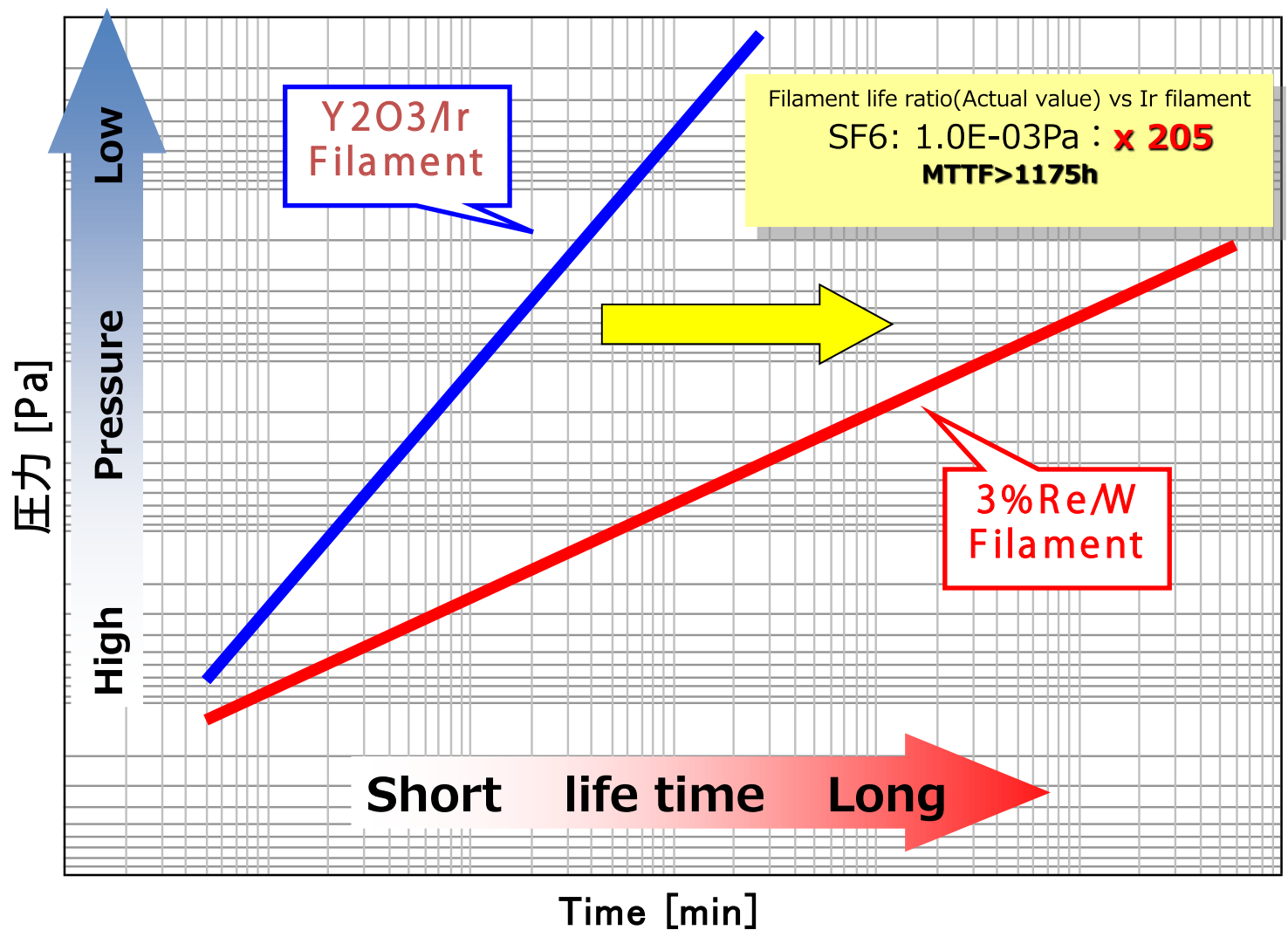
■ **Approach**: Residual gas check for pre/post etching & cleaning

■ **Result** : Detect the unexpected residual Cl. Enable to monitor the correlation between residual Cl and etching rate. Minimize the process batch variation after clean time optimization.

Reference Data



Micropole system Re/W filament
Filament-broken time comparison
(in SF₆ environment)



Micropole system Re/W filament Summary

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Attention of the Re/W type sensor use

- Recommended application is to check chamber condition pre/post deposition process & cleaning process (not in-situ monitor for CVD or Etching process)
- O₂ & H₂O partial pressure monitoring are recommend to run under 1E-3Pa or less. Re/W is sensitive for oxidative atmosphere
- During CVD & Etching process, RGA sensor need to be isolated in order not to be exposed to process chamber. If RGA sensor get deposited by process gas, when it turns on, there is chance to contaminate ion source and make damage for filament.
- Halogen and halogen compound are recommended to monitor under 1E-3Pa or less. (per evaluation result on all past experiments)
- Periodical sensitivity check is recommended due to concern of sensitivity degradation. (10 to 20% degradation could happen for 500h under 3E-3Pa in SF₆ environment)

Reference Data

