

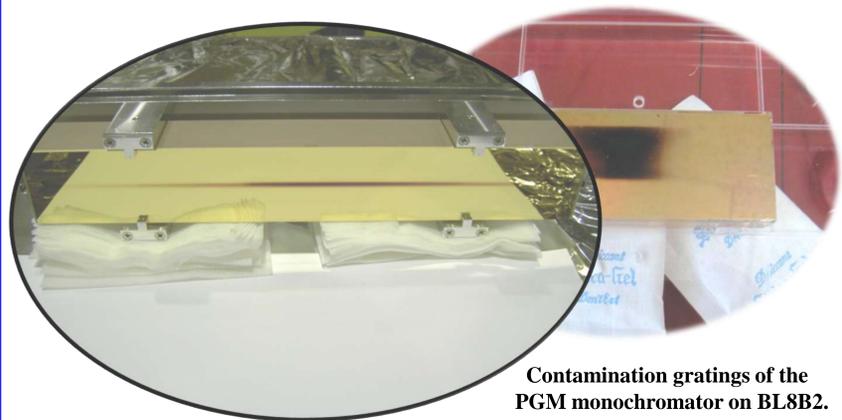
Carbon contamination of SR mirror

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Background & Motivation

When SR irradiates an optical device, it is known well that carbon contamination will arise in an irradiation part.(fig.1)



Contamination gratings of the PGM monochromator on BL8B2.

Fig. 1 Carbon Contamination gratings of the VLS-PGM monochromator on BL4B.

Some kinds of optical measurement in carbon region have been made under the very difficult situation according to the experience of UVSOR.(fig.2)

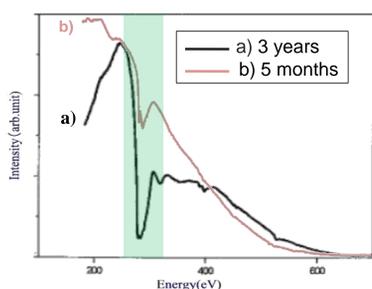


Fig.2 Output spectra at BL8B1 when using the G2 grating(540l/mm;R=15m)
 a) And b) show the spectra 3years and 5months used.

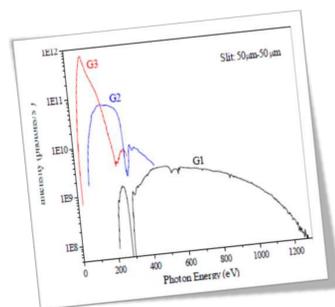
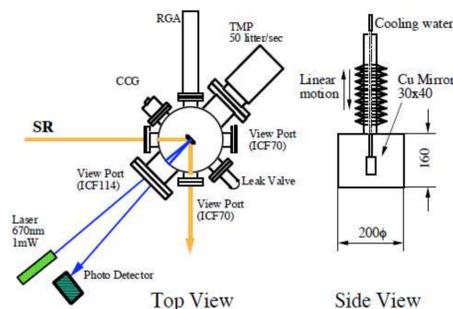


Fig.3 Throughput from the VLS-PGM monochromator on BL4B.

● We tried to investigate How we can reduce carbon contamination on SR irradiated devices.

Experiments set-up



Experiments- I (Cu mirror)

(This mirror was fabricated by precision lathe, it can water cooling)

1. Temperature effect and Gas purge effect (Fig.4)
 Temperature : 10 °C~ 50 °C (1x10⁻⁵Pa)
 Gases : CO₂ (1x10⁻³Pa), CH₄ (1x10⁻⁴Pa)

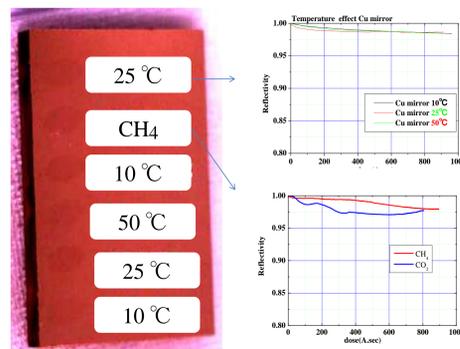
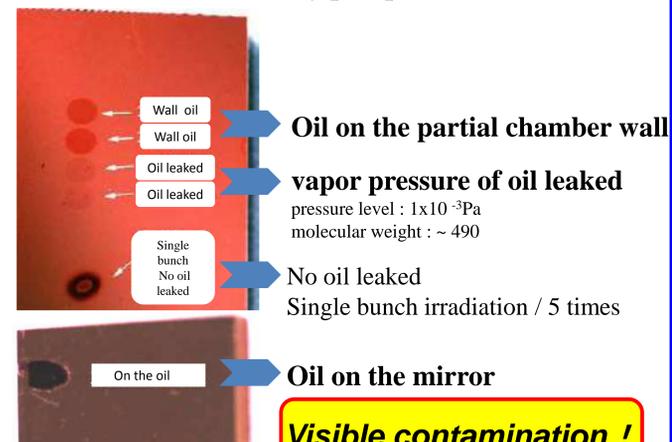


Fig.4

No Change

2. The effect of the rotary pump oil was tested.



Visible contamination !

Experiments- II (BK7, Al + MgF₂ coated)

1. Ethanol effect (Fig.5)

Maybe, it changes.

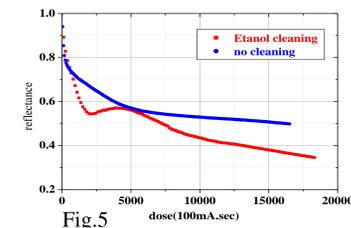


Fig.5

2. Temperature effect (fig.6)

High temperature is good ?

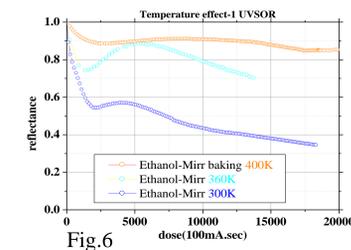


Fig.6

3. Gas purge effect (Fig.7)

No Change .

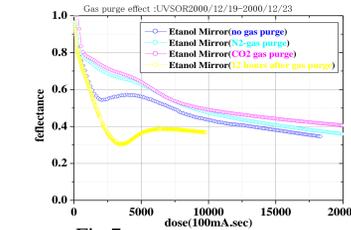
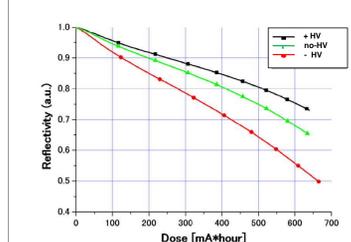


Fig.7

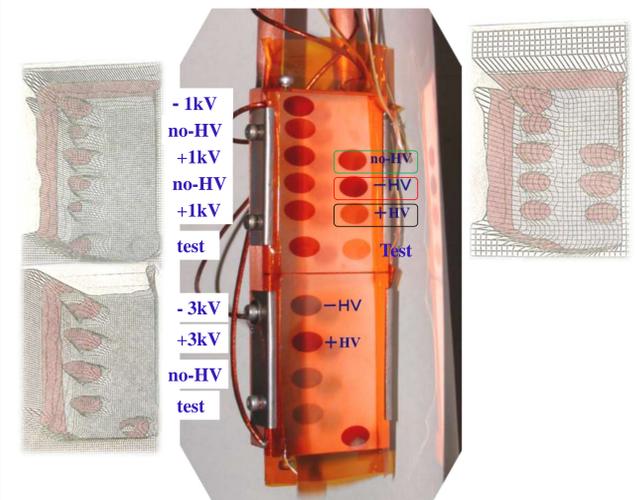
Experiments-IV (Cu mirror)

How we can reduce carbon contamination?

Electric field effect



* Oil on the partial chamber wall
 * temperature : 25°C water cooling

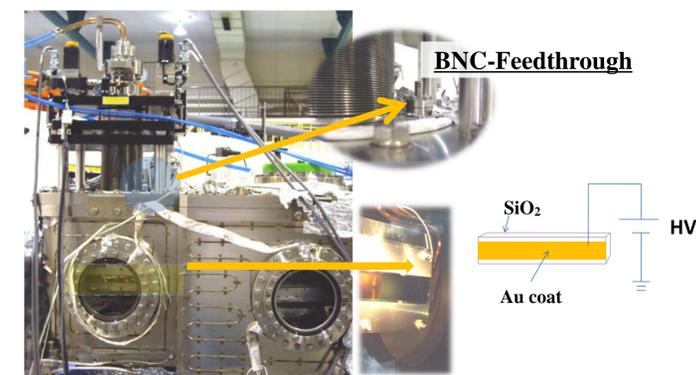


Summary & futures

The **voltage** was **effective**. Really, **positive voltage** is good?



We have developed a new apparatus for applying HV to the materials. aiming for the protect from carbon contamination.



M0 mirror of BL5U



should be continue more investigation about long time stability and chemical reaction on the surface of materials by HV effects.

Acknowledgements

We would like to thank the UVSOR staff and the KEK staff for their great help. We are especially grateful to Mikito Tadano and Takashi Naito for invaluable contributions to the experiment.

Experiments- III (Al,Pt,Au coat mirror)

1. Material's dependence (fig.8)

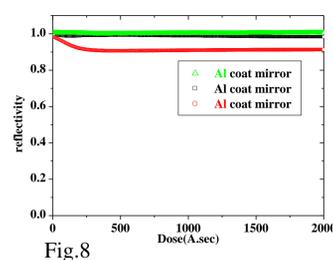


Fig.8

No dependence.

2. Gas purge effect (fig.9)

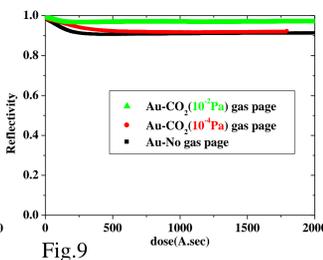


Fig.9

No Change .