



FP initiative

International initiative on x-ray fundamental parameters

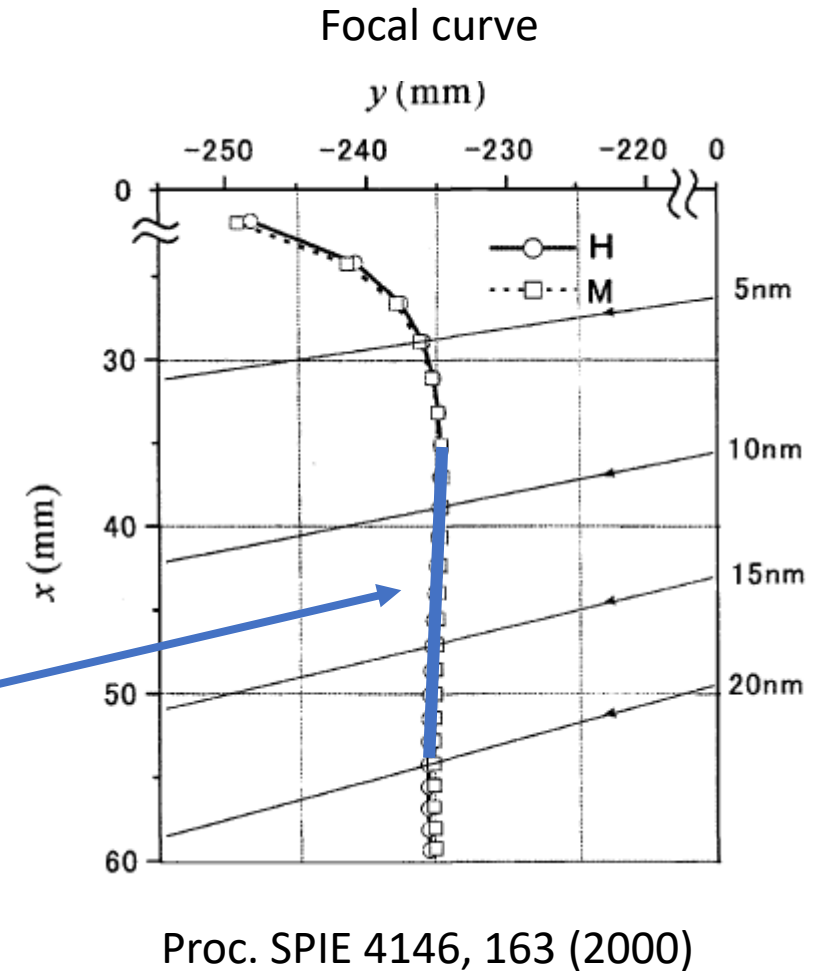
X-ray spectroscopy in the ultra-soft x-ray range with a reflection zone plate spectrometer

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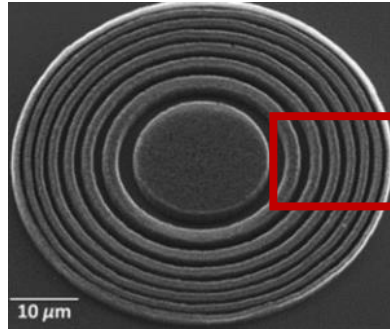
WDS – Grating spectrometer

- Periodic grating requires scanning
- **Use of variable line spacing (VLS) grating**
- Soft x-ray flat-field spectrometer
- Wavelengths focused on a line
- Linear detector or **CCD camera**
- No more scanning

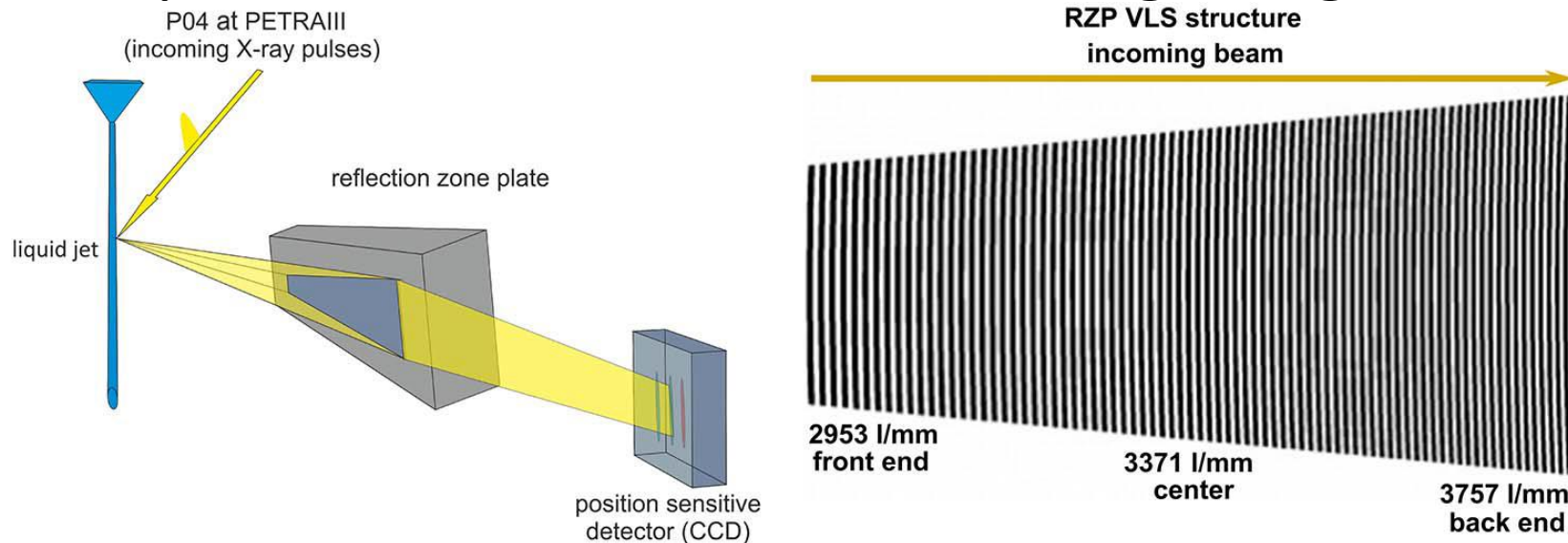


WDS – Grating spectrometer – RZP

- Fresnel lenses
- Reflection zone plates

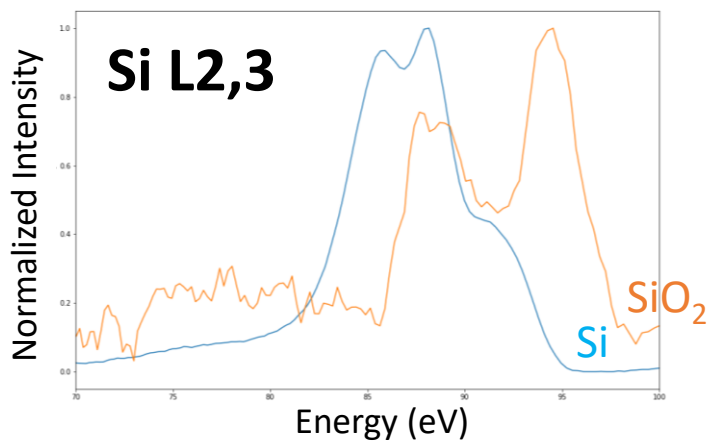
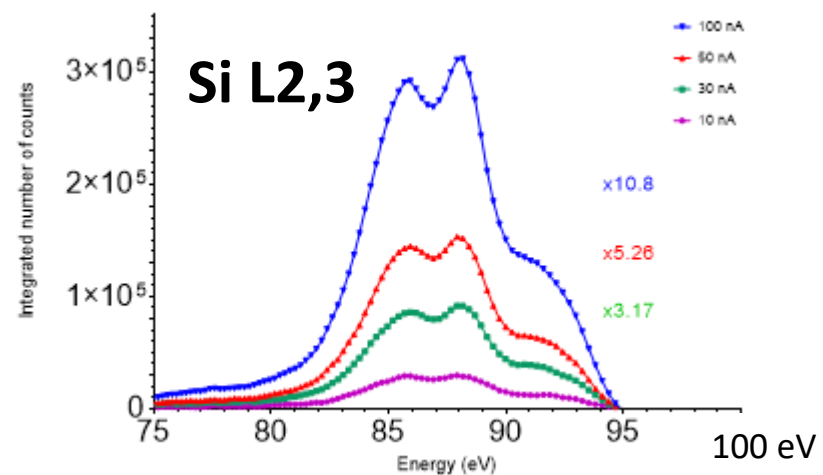
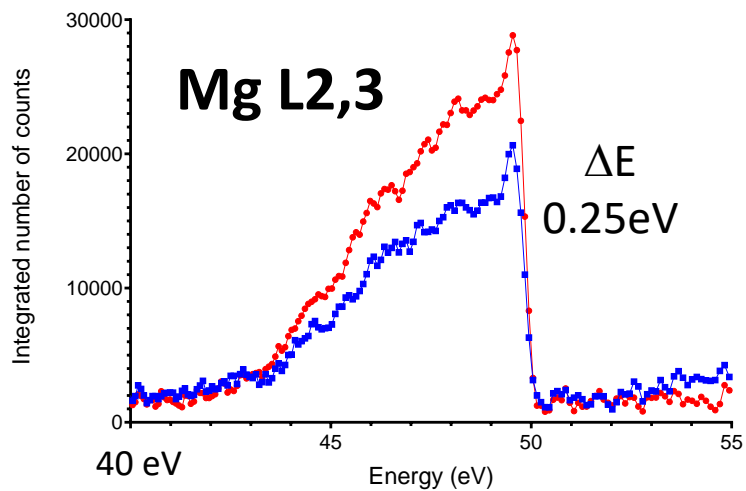


- **Reflection (Fresnel) zone plate (RZP) spectrometer**
- Only a part of the RZP is used as a VLS grating



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WDS – Grating spectrometer – RZP

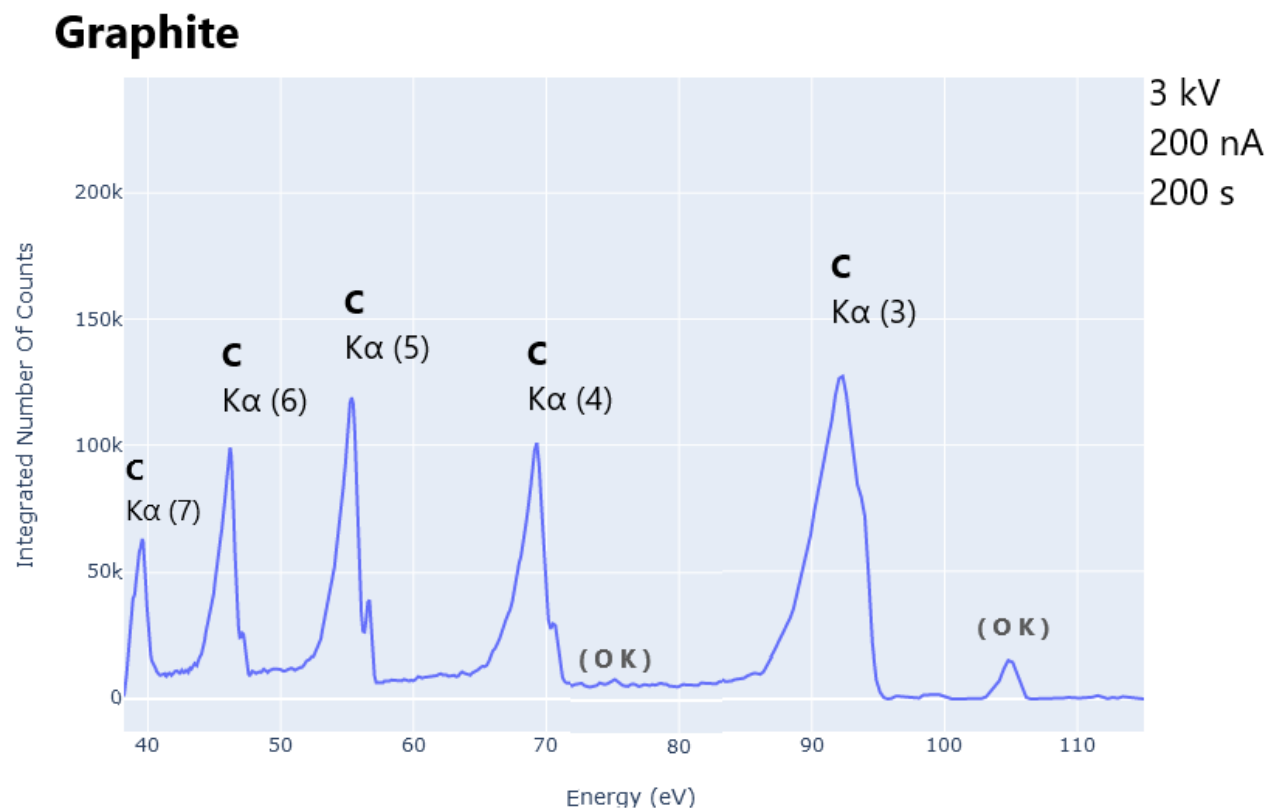
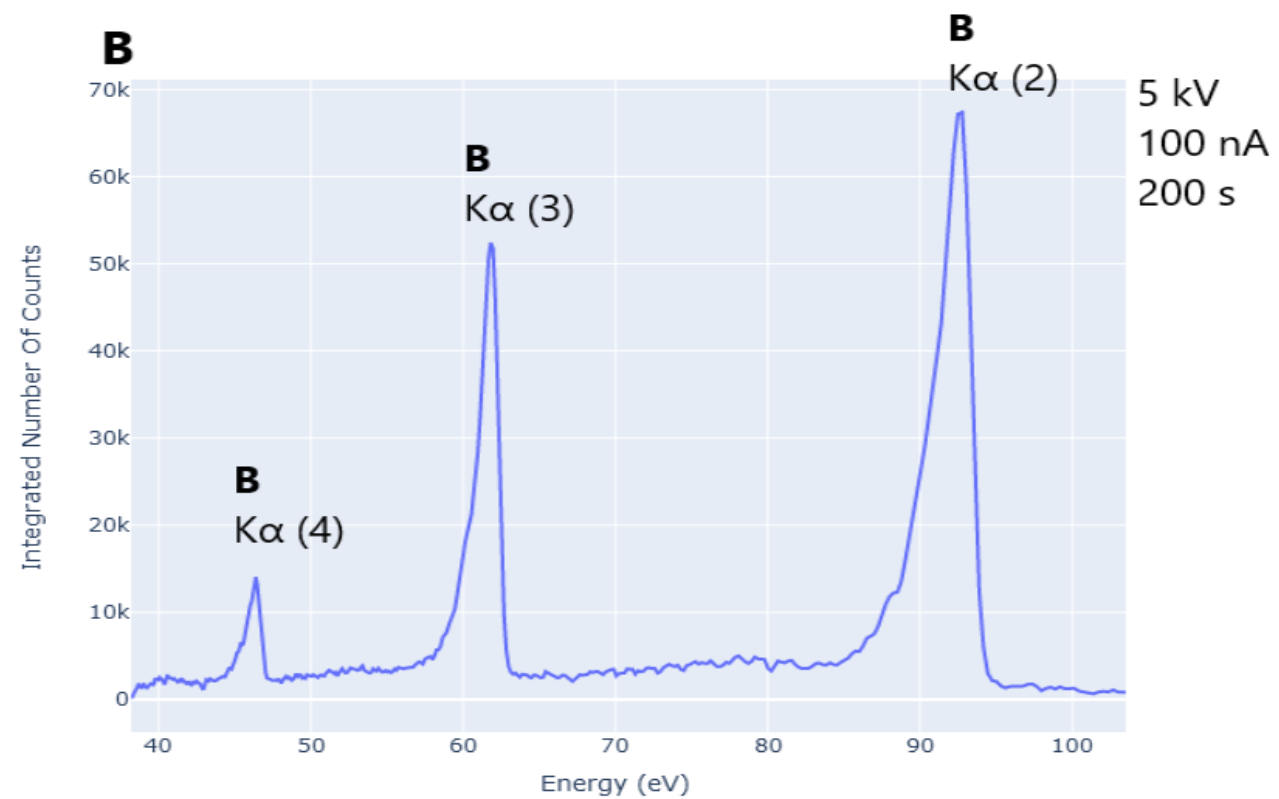


CAMECA SX100
EPMA

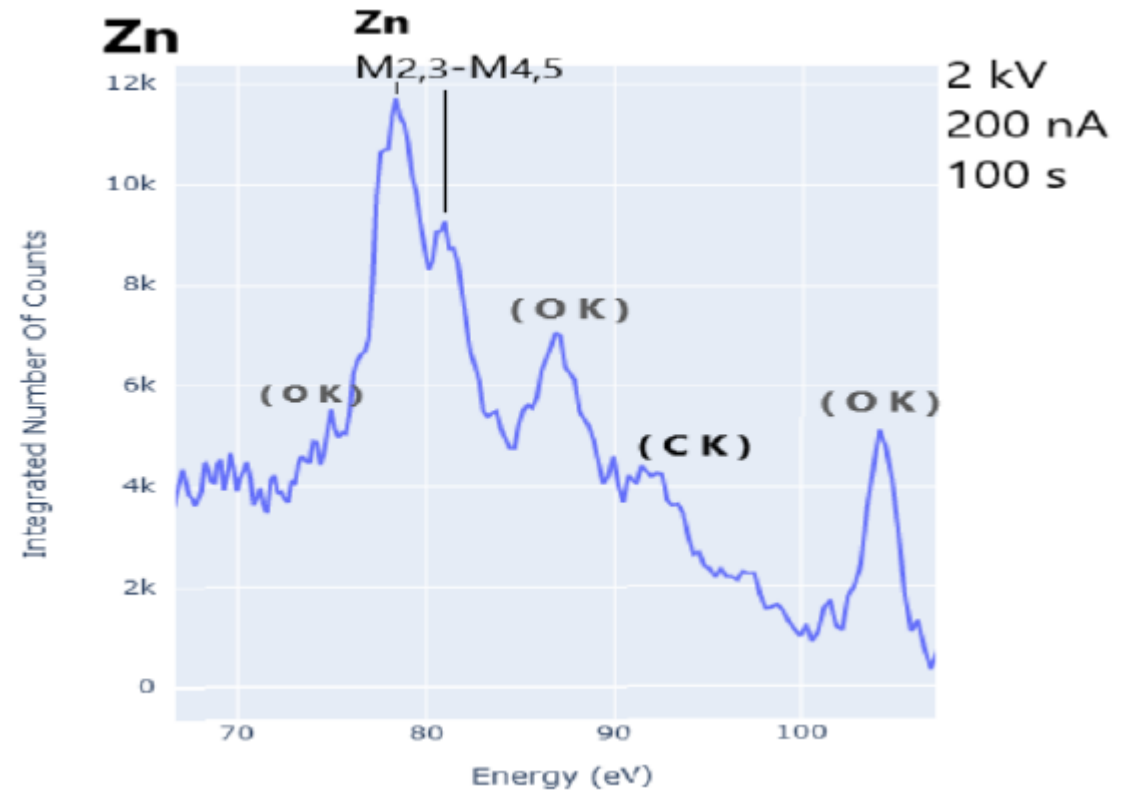
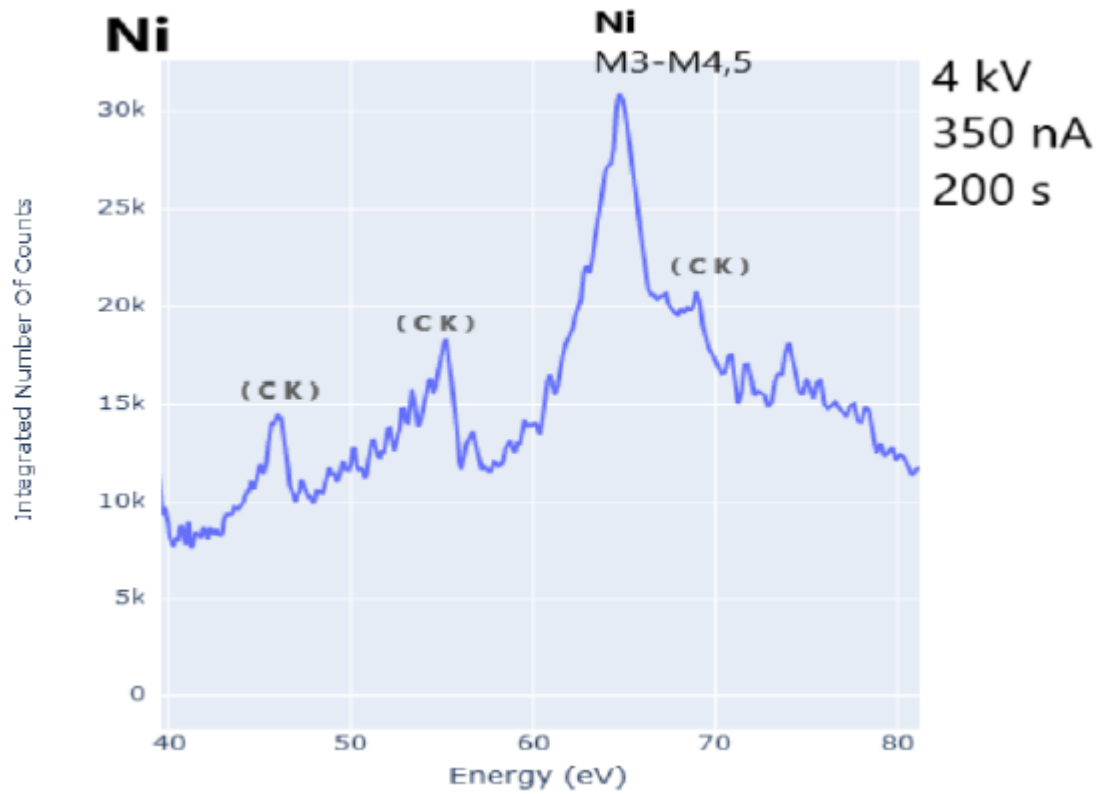
NOB spectro-
meter



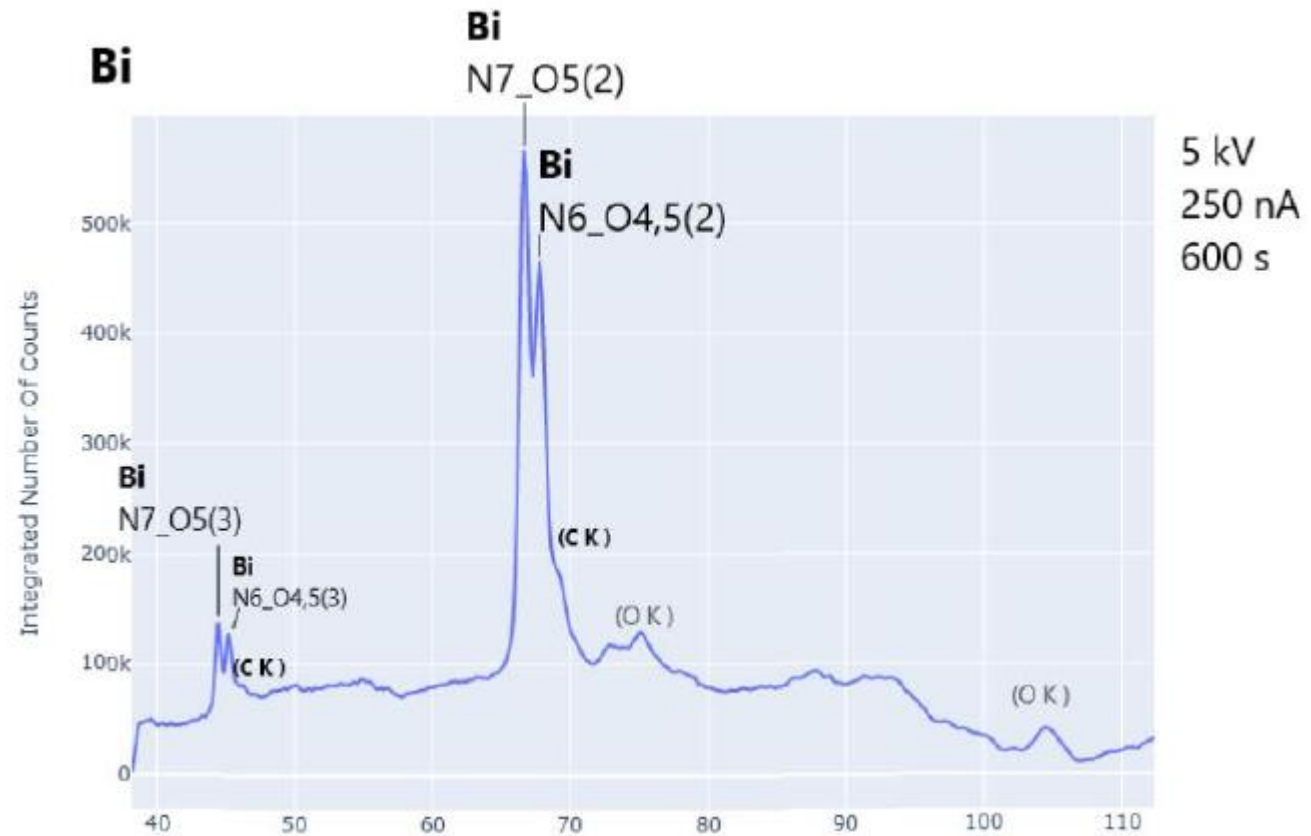
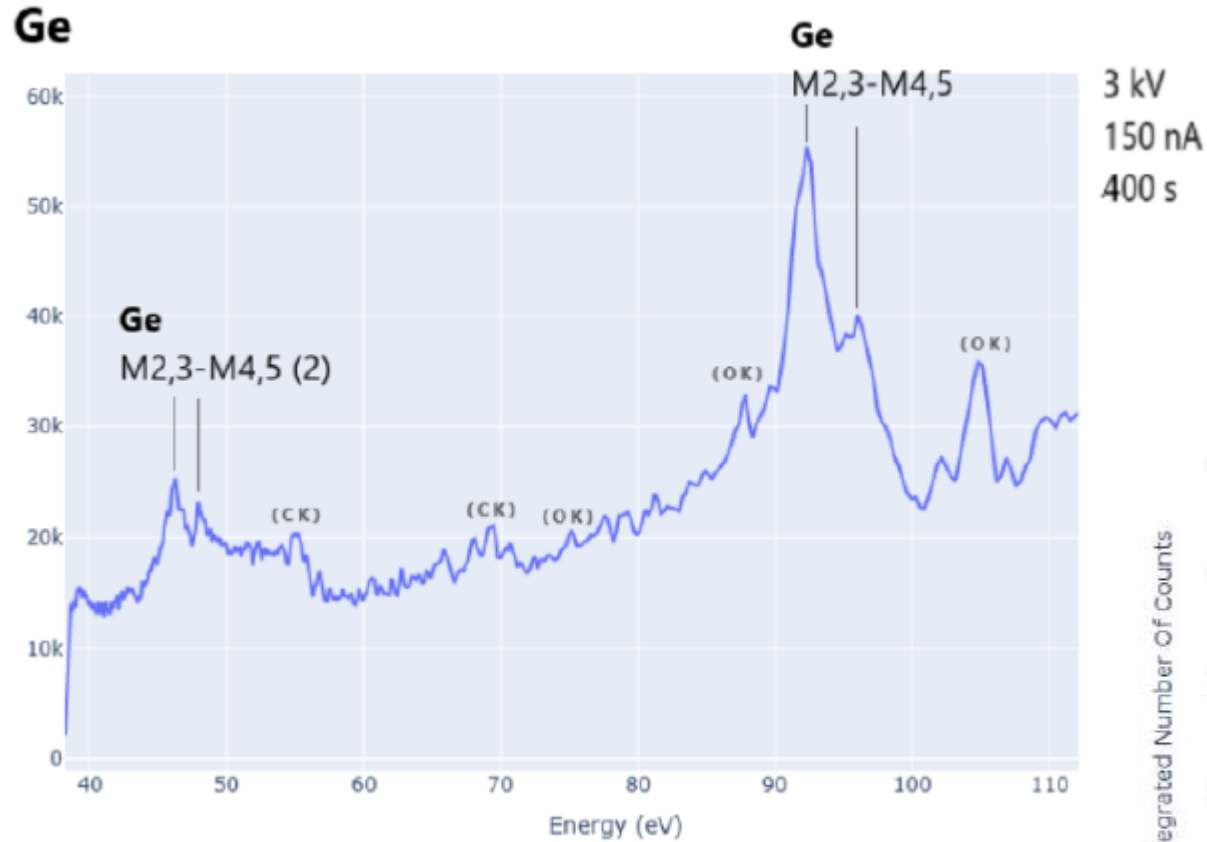
Some spectra



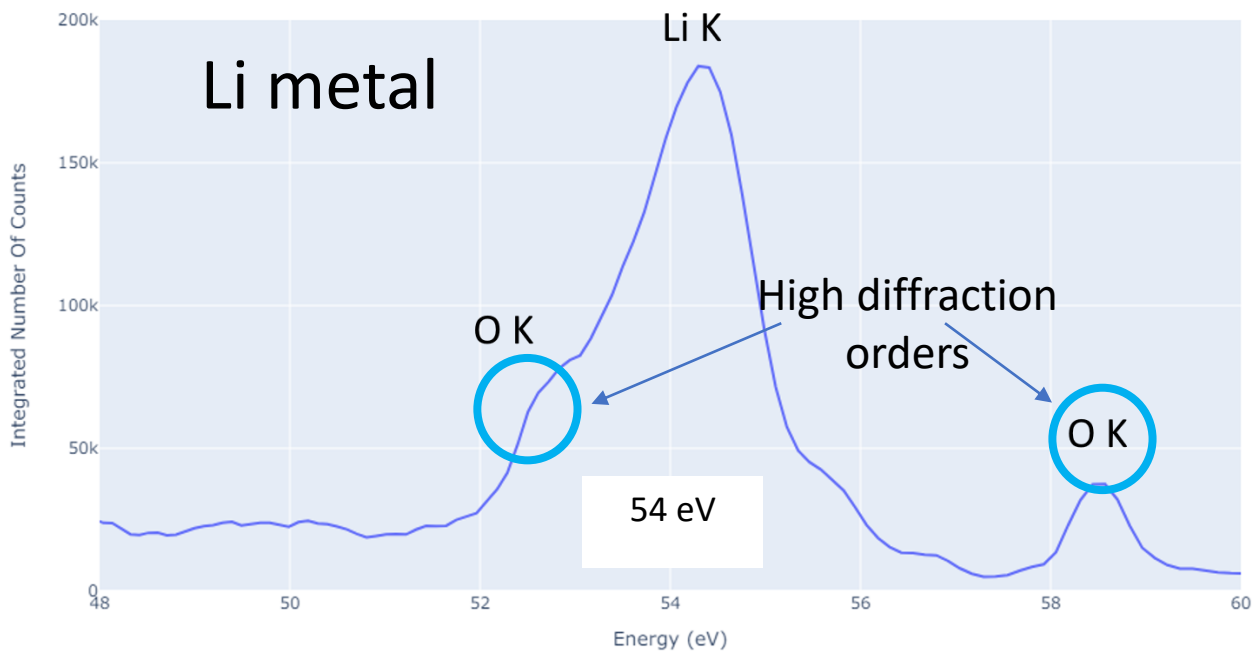
Some spectra



Some spectra

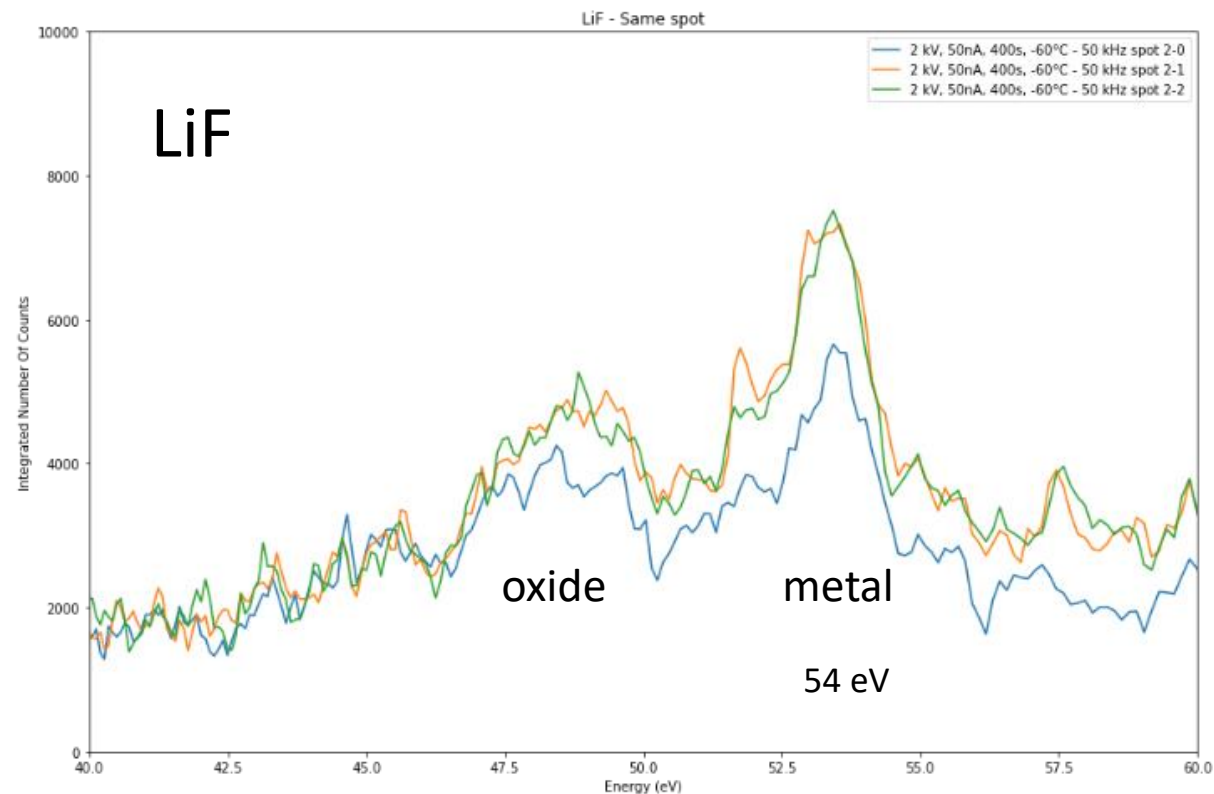


Li K range

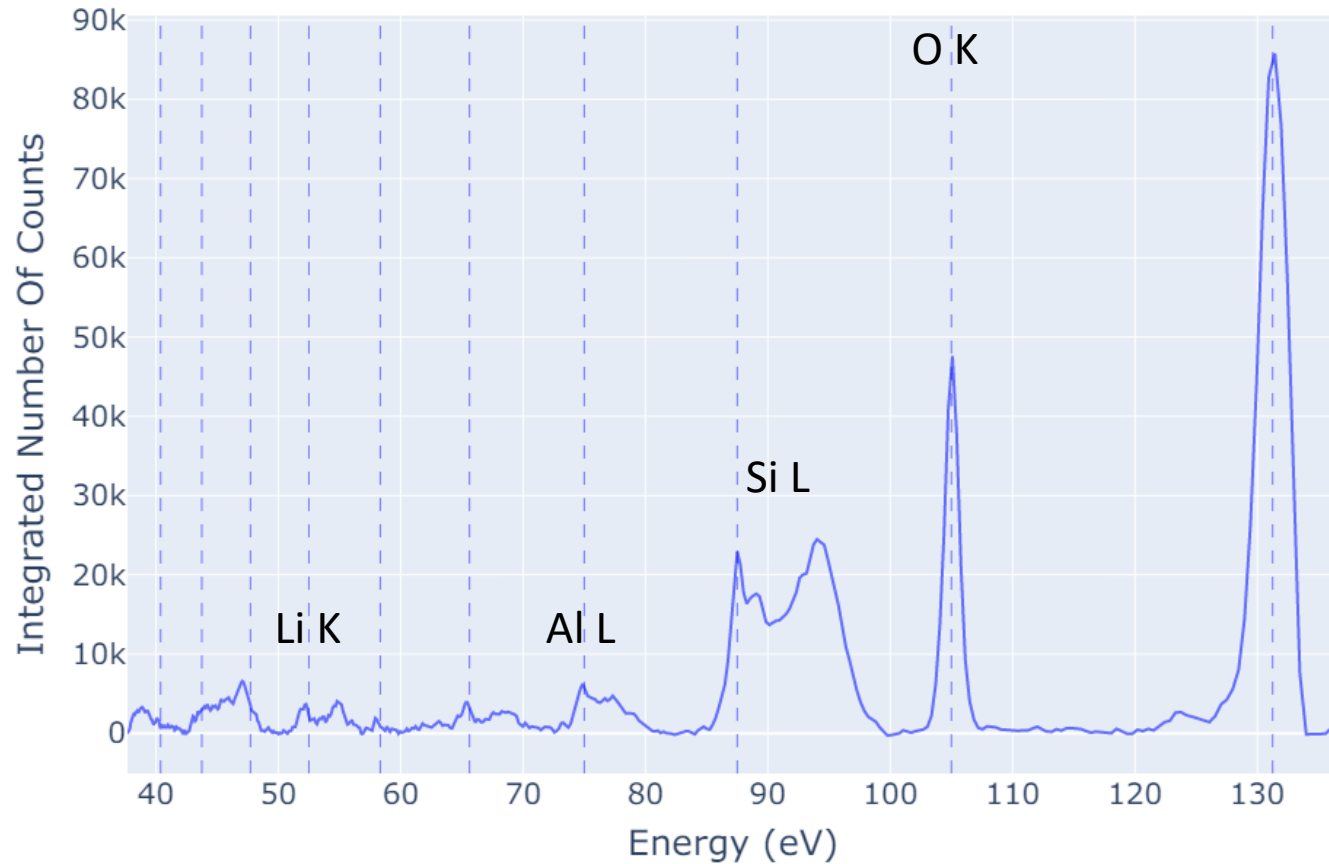


Interference with O Ka emission diffraction at high orders

Damaging of the sample by the electron beam



Li K range – Lepidolite – $\text{K}(\text{Li},\text{Al})_3(\text{Si},\text{Al})_4\text{O}_{10}(\text{F},\text{OH})_2$



Conclusion

- RZP spectrometer setup on a “standard” electron microprobe
- Standard = W filament; HT min 2 kV; no preparation chamber; no cryo-holder; ...
- Spectral range 40-120 eV
- Spectral resolution: 0.25 eV @ 40 eV 0.75 eV @ 120 eV

- Thanks to ANR SQLX project (ANR-20-CE29-0022; <https://anr.fr/Projet-ANR-20-CE29-0022>) and particularly to K. Hassebi, W. Aid, N. Rividi, K. Le Guen, V. Ilakovac, M.-C. Lépy
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