Appendix A

to

ELECTRON MICROPROBE/SIMS ANALYSES OF Al IN OLIVINE: APPLICATIONS TO SOLAR WIND, PALLASITES, AND TRACE ELEMENT ANALYSES.

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XPS Modeling

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Typical SC3 olivine Al 2p peak, Mg 2s peak to the left. The small Al 2s peak (not shown) is present which confirms identification. Data red; fit black. All 12 spots analyzed have measurable Al 2p peak with an average about 500 cps. For comparison, single crystal sapphire standard $2x10^4$ cps.

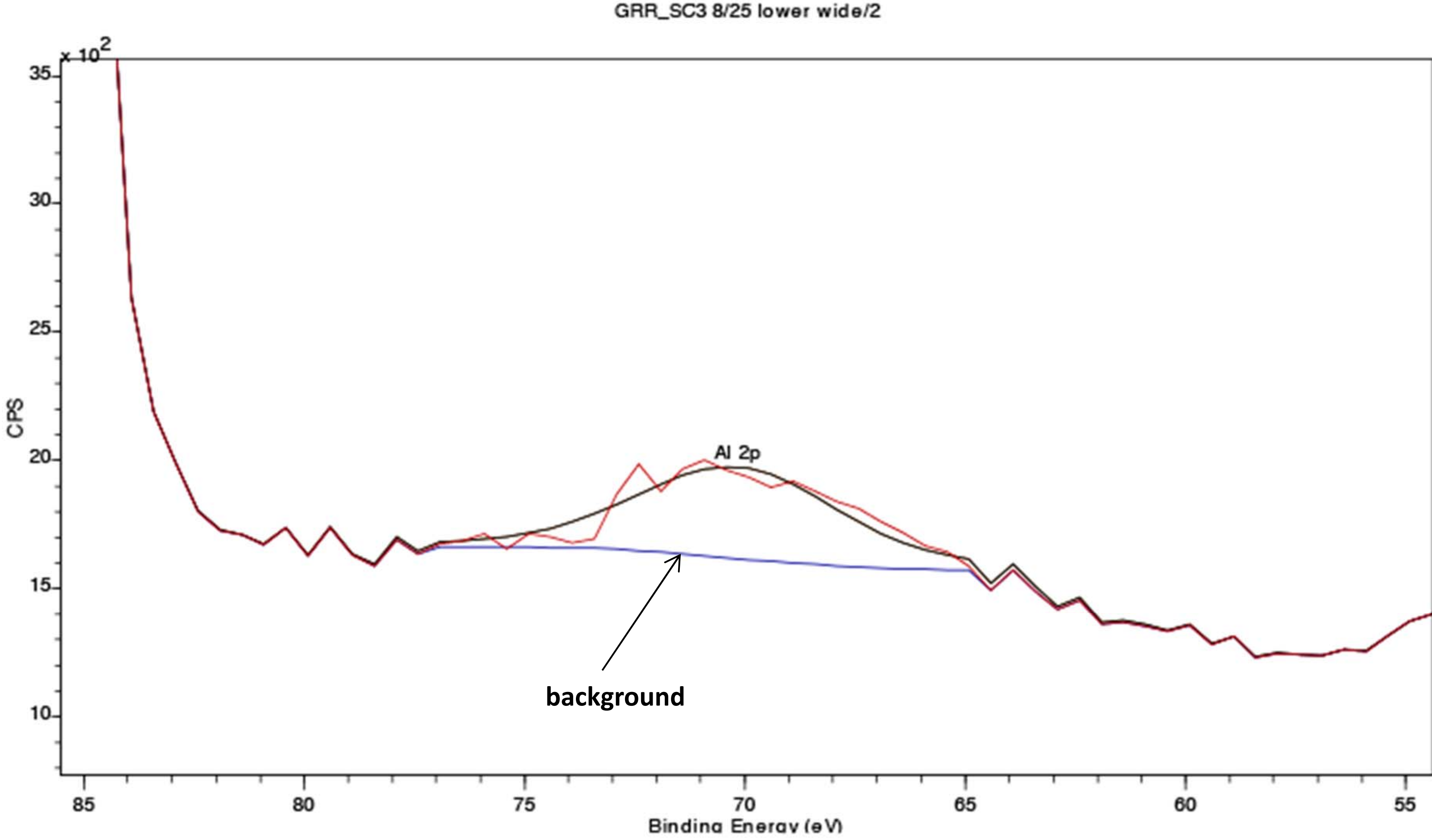

Figure A1

For sapphire standard:

$$\text{cps Al sapphire} = k\ n\ A\ \lambda\ \sin(\theta) \quad \text{(A1)}$$

k = cons; n = atoms Al/cc in sapphire; A = X-ray beam area; λ = photoelectron mean free path (≈16 A);
θ = photoelectron take off angle (35 degrees).

For monolayer of Al contamination on olivine:

$$\text{cps Al ol} = k\ N\ A \quad \text{(S2)}$$

N = contamination atoms of Al/ cm^2

$N = n\ [\ I(ol) / I(sap)\ ]\ \lambda \sin(\theta) \approx 2e13$ atoms/cm^2
I=intensity

If mean emp emission depth of Al Kα X-ray in olivine is 2 micron, for 100 ppm Al , about 100×10^{13} atoms/cm^2.

X-rays from surface contamination detected with more efficiency.

So SC3 Al contamination ≥ 2%