

Filter, Voltage and Current Selection For Optimum XRF Elemental Group Analysis

*To optimize for particular elemental groups one wants to use filters and settings that “position” the X ray energy impacting the sample just above the absorption edges of the element(s) of interest. Examples of how to go about this is given below. Note as well that the depth of analysis is also very much a function of both the x ray energy used to probe the material and the element that is being excited, both are exponential functions dependent on the matrix of elements that the material is composed. **The tube current setting is to just optimize the RAW COUNTRATE in the detector so it is between 1000 and 10,00 for the Tracer III V and V+ instrument and 1000 to 120000 for the Tracer III SD system. It should be adjusted to meet this requirement.***

Screening for all Elements (Lab Rat mode):

1. No filter
2. 40 kV
3. Highest available micro amps (for non metallic samples)
4. Lowest available micro amps (for metallic samples)
5. Utilize the vacuum.

These settings allow all the x rays from 1 keV to 40 keV to reach the sample thus exciting all the elements for Mg to Pu.

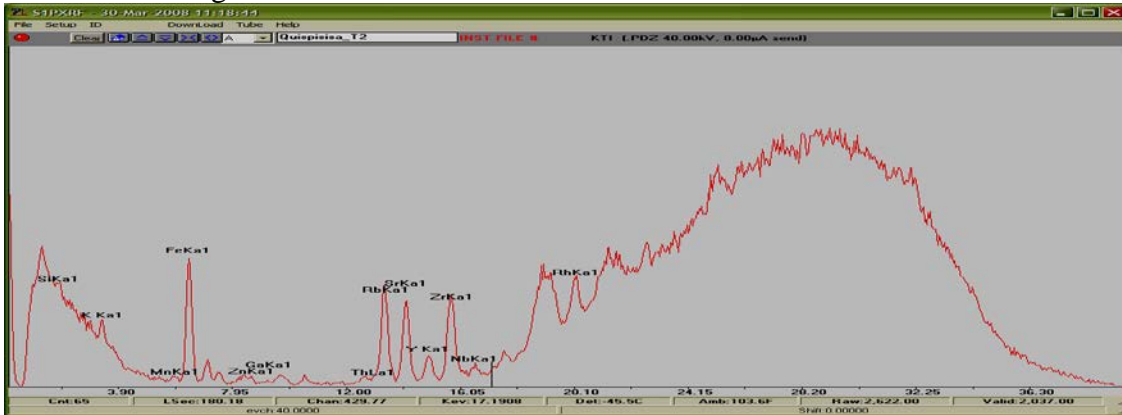
To optimize for particular elemental groups one wants to use filters and settings that “position” the X ray energy impacting the sample just above the absorption edges of the element(s) of interest. Examples of how to go about this is given below. Note as well that the depth of analysis is also very much a function of both the x ray energy used to probe the material and the element that is being excited, both are exponential functions dependent on the matrix of elements that the material is composed.

Measurement of Silicate or Ceramic materials for higher Z elements (Rb, Sr, Y, Zr, and Nb):

1. 0.006” Cu, .001” Ti, .012 Al Filter (**green filter**)
2. 40 kV
3. Highest current setting available
4. No vacuum

These settings allow all the x rays from 17 keV to 40 keV to reach the sample thus efficiently exciting the elements from Fe to Mo. These are some of those key to identifying the origin of the obsidian. There is little or no sensitivity to elements below Fe

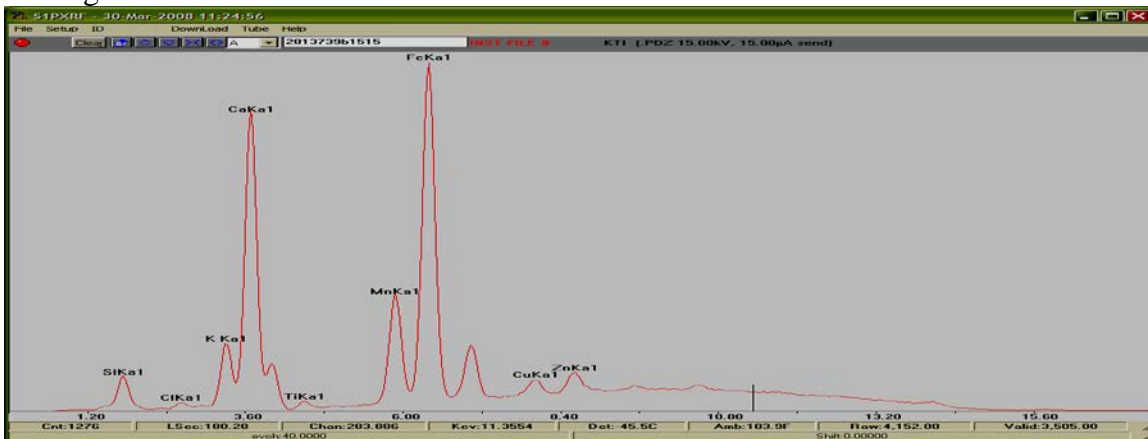
with these settings.



Measurement of Mg, Al, Si and P to Cu (and any L and M lines for the elements that fall between 1.2 and 8 keV)

1. No filter
2. 12 to 15 kV
3. Highest current setting available
4. Vacuum

These settings allow all the x rays from the tube up to 15 keV. In particular this allows the Rh L(2.5 to 3 keV) lines from the tube to reach the sample. These are particularly effective at exciting the elements with their absorption edge below 2.3 keV. Note this set up is **not** good for Cl and S detection, as the scattered Rh L lines interfere with the x rays coming from these elements.



Measurement of Mg, Al, Si, P, Cl, S, K, Ca, V, Cr, and Fe (and any L and M lines for the elements that fall between 1.2 and 6.5keV)

1. Ti filter (*blue Filter*)
2. 15 to 20 kV
3. Highest current setting available

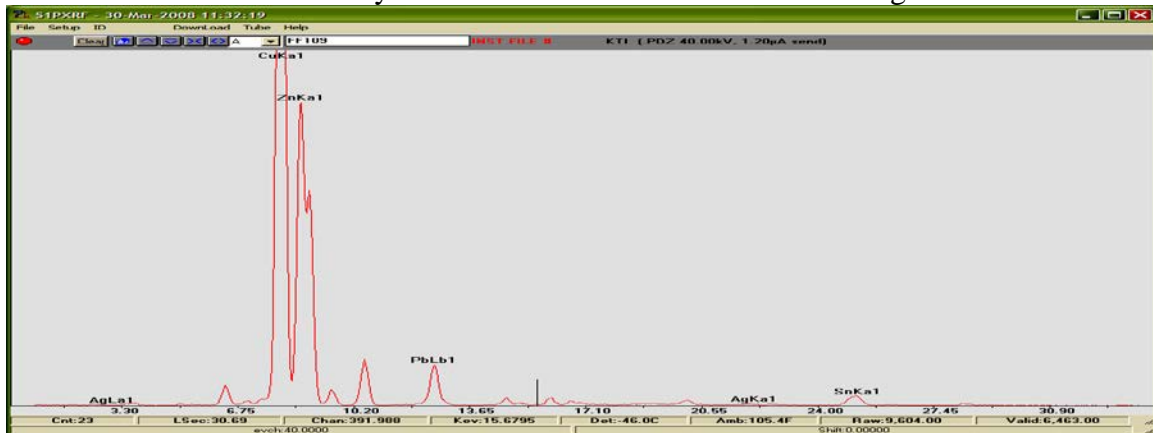
4. Vacuum

These settings allow x-rays from 3 to 12 keV to reach the sample. In particular this does **not** allow the Rh L lines from the tube to reach the sample. These Rh L x rays would interfere with Cl and S analysis. For example, this is a very good set up for measuring Cl on the surface of Fe.

Measurement of metals (Ti to Ag K lines and the W to Bi Lines):

1. 0.001" Ti, .012 Al (*Yellow filter*)
2. 40 kV
3. Lowest current setting (monitor the count rate)
4. No vacuum

These settings allow all the x rays from 12 keV to 40 keV to reach the sample thus efficiently exciting the elements noted above. These are the settings used to calibrate the system for all modern alloys of those elements of those listed in the title of this section. There is little or no sensitivity to elements below Ca with these settings.



Measurement of Poisons (higher Z elements Hg, Pb, Br, As):

1. 0.001" Cu, .001" Ti, .012 Al (*Red Filter*)
2. 40 kV
3. Highest current setting available
4. No vacuum

These settings allow all the x rays from 14 keV to 40 keV to reach the sample thus efficiently exciting the elements Hg, Pb, Br, As. These are some of the key elements that were used to preserve organic based artifacts. There is little or no sensitivity to elements below Ca with these settings.

