Vassar College Tracer Handheld XRF
Quick start up MUST DO list

By Dr. Bruce Kaiser, edited by J. Tanski 4/28/10

On the instrument:

- See "Filter and Voltage and Current Selection.pdf" to decide on instrument settings for your sample.
- Put desired filter in filter slot (brass screw), use clamp, oval face down.
- If doing low mass elements (< Ca) connect vacuum system; should achieve 2 torr.
- Connect PDA or computer serial cable to instrument; line up red dot and do not twist!
- Insert battery or connect instrument to AC power.
- Insert power key and turn instrument on (yellow light should come on). It takes ~30 sec for the detector to cool, ~60 sec for the X-ray tube to warm and microprocessors to boot.
- Cover IR safety sensor with masking tape if sample too small to obscure sensor.
- Place sample in front of vacuum window.
- Make sure you've waited at least 1 minute before launching software….

Start up software:

- Connect the instrument interface cable to the serial port on the computer.
- Double click on S1PXRF icon on desktop.
- Under DOWNLOAD check BAUD RATE to assure that it is 57600.
- In S1PXRF, under DOWNLOAD, Port, Comm1 (click on it and enter comm #). In order to get port if this does not work, on the computer go to the start menu/control panel/system/ hardware/device manager/ports/comm #.
- Under FILE do PDZ PREVIEW and bring in a previously stored file so the spectrum is visible on the screen; this brings in the necessary parameters.
- Click on the red dot to turn it green if it is not already green. Usually, checking the port number will turn it green.
- Under TUBE go to kti tube and then click on read and select the desired voltage and current (or set it with XRayOps).
- While this screen is up, activate the instrument and assure that it goes to the correct voltage and current.

You are now ready for analysis!

- Click start.
- Pull switch and hold or use timed assay feature (must still hold switch).
- Name and save your spectra.
- When disconnect pump: open release valve, turn off pump, then disconnect.

Quick spectrum analysis:

- If no spectrum displayed, under FILE do PDZ PREVIEW and browse.
- ID brings up analysis buttons; click Elem to get periodic table (R hides it).
- For Mg to Ba, use K line emissions.
- For Ba to Pu, use L line emissions.
- Right click on an element to see list of emission lines.
- Use < > buttons to more cursor.
- Save as in C:/VCspectra/

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 10,000. 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.

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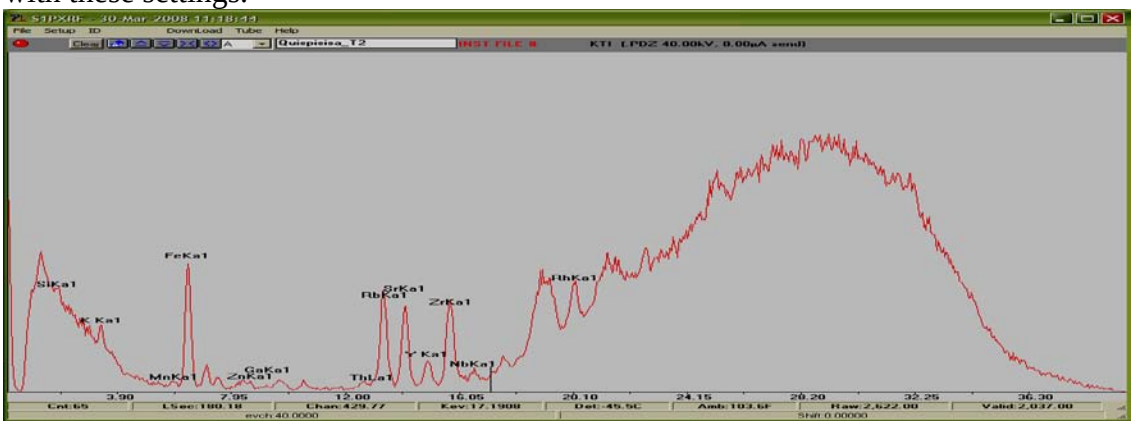
Measurement of Obsidian for higher Z elements (Rb, Sr, Y, Zr, and Nb):

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

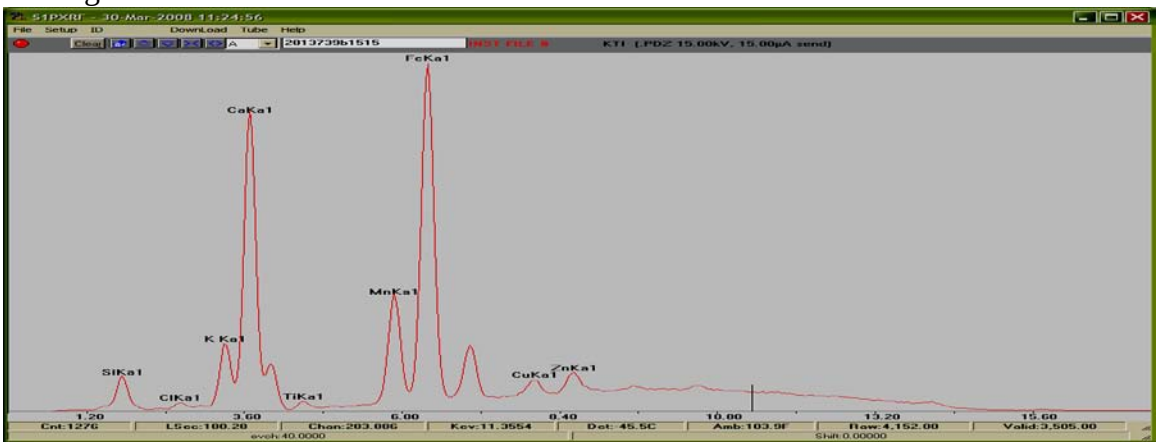
with these settings.



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 to15 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

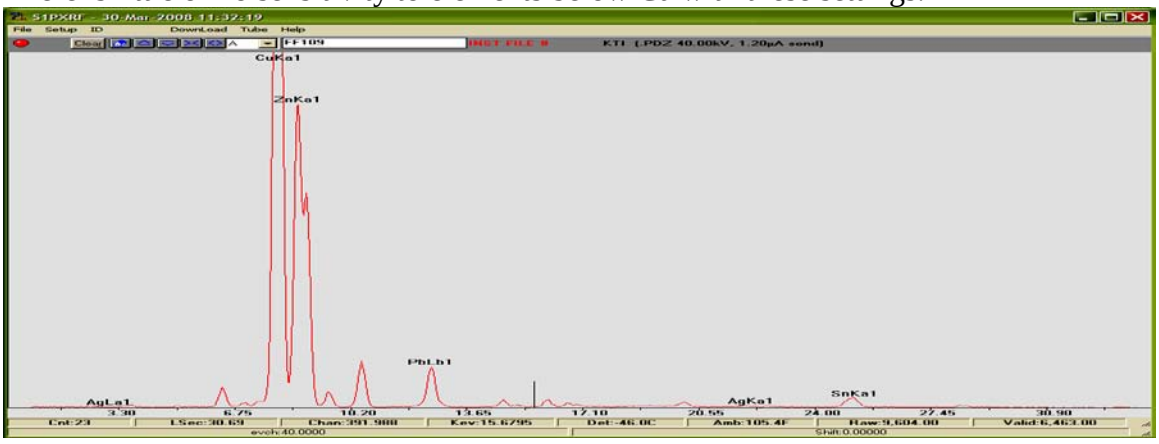
4. Vacuum

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

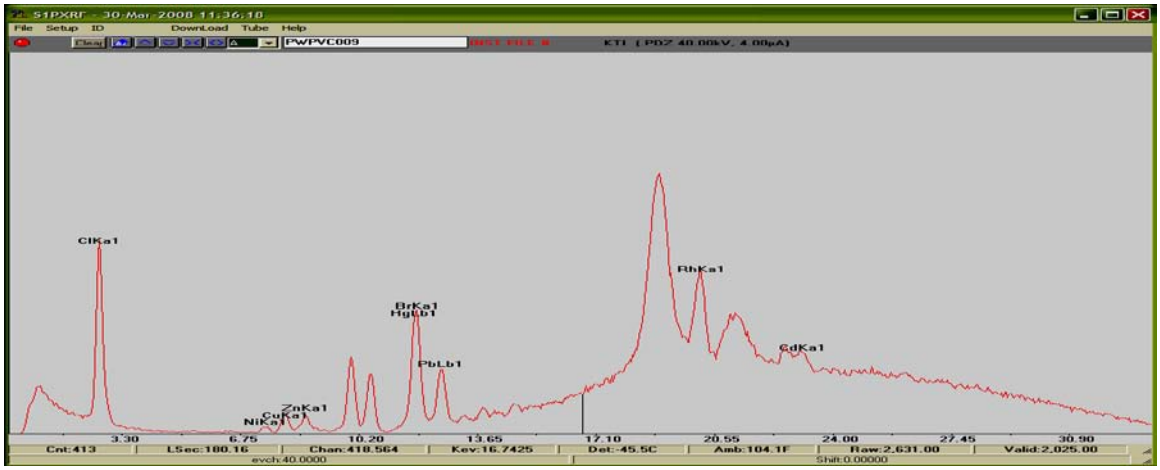
These settings allow all the x rays from 12 keV to 40 keV to reach the sample thus efficiently exciting the elements noted above. These are the settings used to calibrate the system for all modern alloys of those elements of those listed in the title of this section. There is little or no sensitivity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


S1PXRF - 30-Mar-2008 11:36:18
File Setup ID DownLoad Tube Help
PWPVC009
KTI (PD2 40.00kV, 4.00μA)
ClKa1
BrKa1
HgLb1
PbLb1
NiKa1
CuKa1
ZnKa1
RhKa1
CdKa1
3.30
6.75
10.20
13.65
17.10
20.55
24.00
27.45
30.90
Cnt:413
LSec:180.16
Chan:418.564
Kev:16.7425
Det:-45.5C
Amb:104.1F
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Valid:2,025.00
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