Cu Patina Analysis

BRUKER

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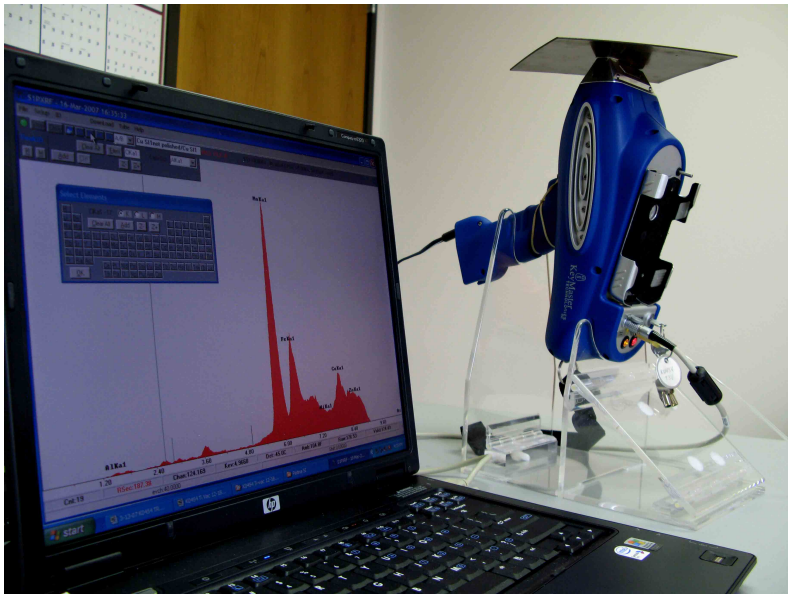
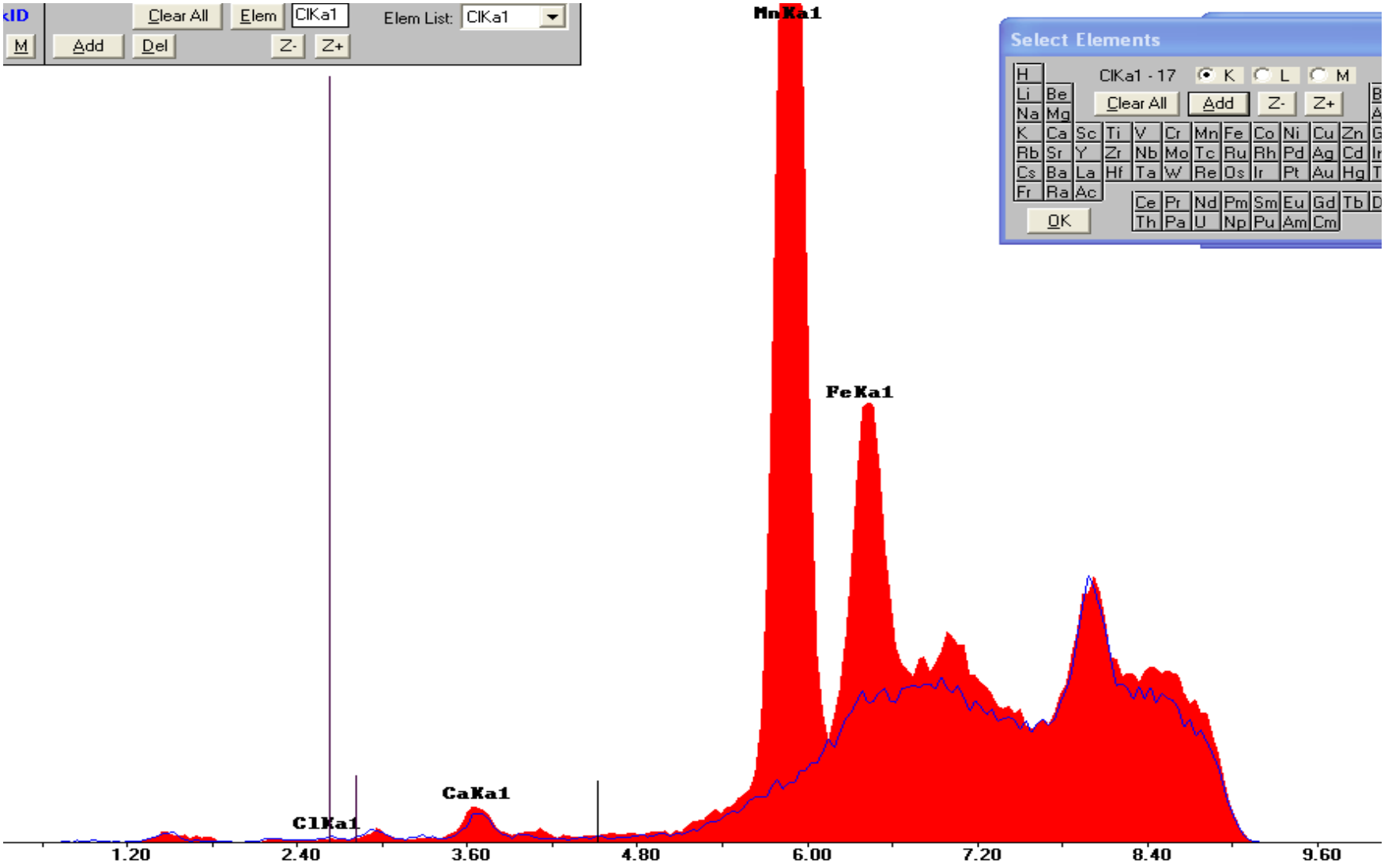
Setup the KeyMaster Handheld XRF System for Cu Patina Analysis

- Put in a Cu secondary target 0.001” into filter slot
- Use 10kV and 30 micro amp setting for the x ray tube
- Hook up the vacuum pump and turn it on
- The instrument is now optimized for patina analysis

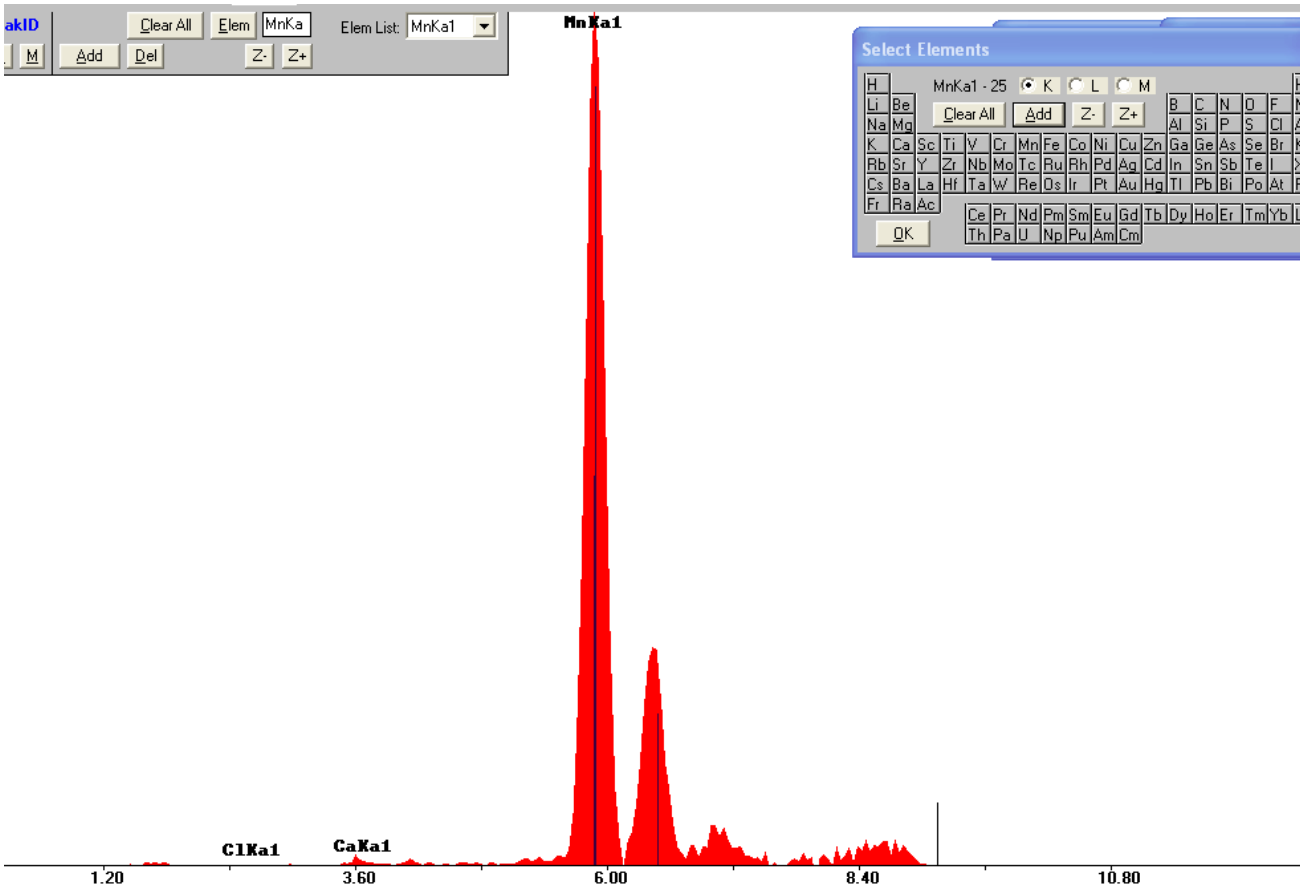


This setup does 4 things:

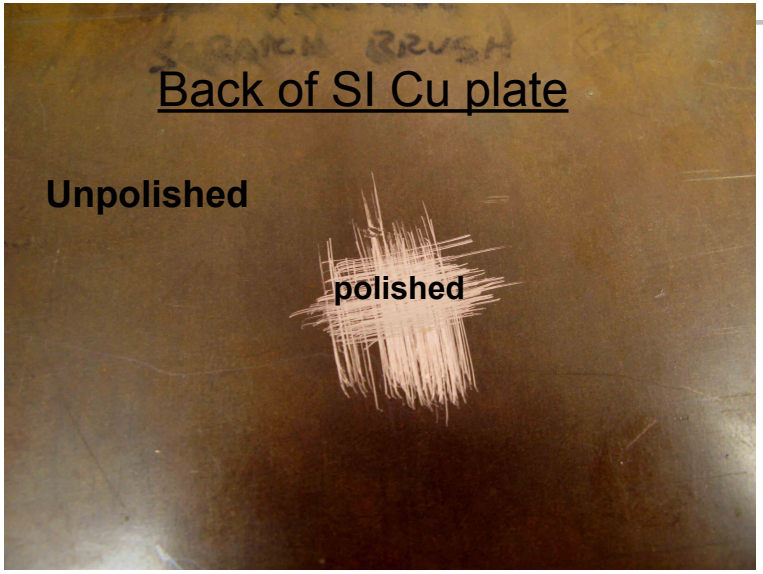
- it eliminates the Rh L lines
- it efficiently excites all elements below Cu K lines and the L lines of elements above Tc
- it does not effectively excite the Cu K lines, so even though you are on a Cu substrate it does not interfere with the patina analysis
- it effectively only analyzes the very surface of the copper (the patina)



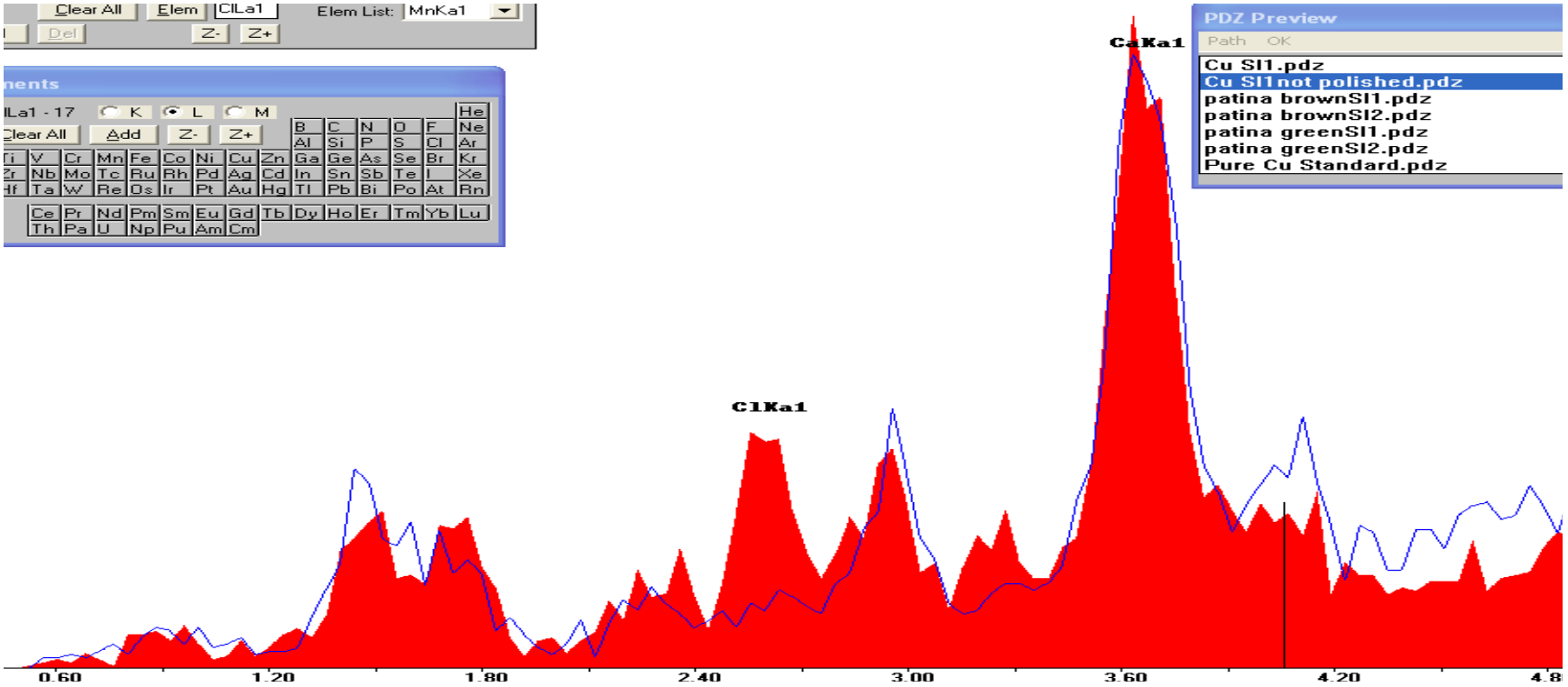
The blue spectrum is of pure copper the red spectrum is the Smithsonian Institute (SI) base material (polished with no patina). Using the instrument in alloy mode, it showed the base copper to be C65500-82A (1.02Mn/95.76Cu). A difference spectrum for these 2 spectra is shown in the next side.



This is the difference spectrum of pure Cu and the SI Cu alloy. Clearly Mn and a trace of Fe are present in the SI Cu alloy.



The red spectrum is the unpolished back side of the SI Cu plate. The blue spectrum is the polished spot on the back side of the SI Cu plate. One can see that the unpolished surface shows a trace of Cl. The next slide shows the Cl on an expanded scale.



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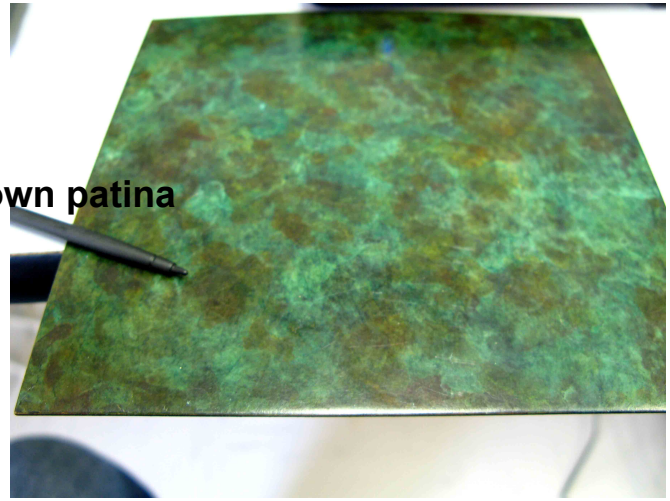
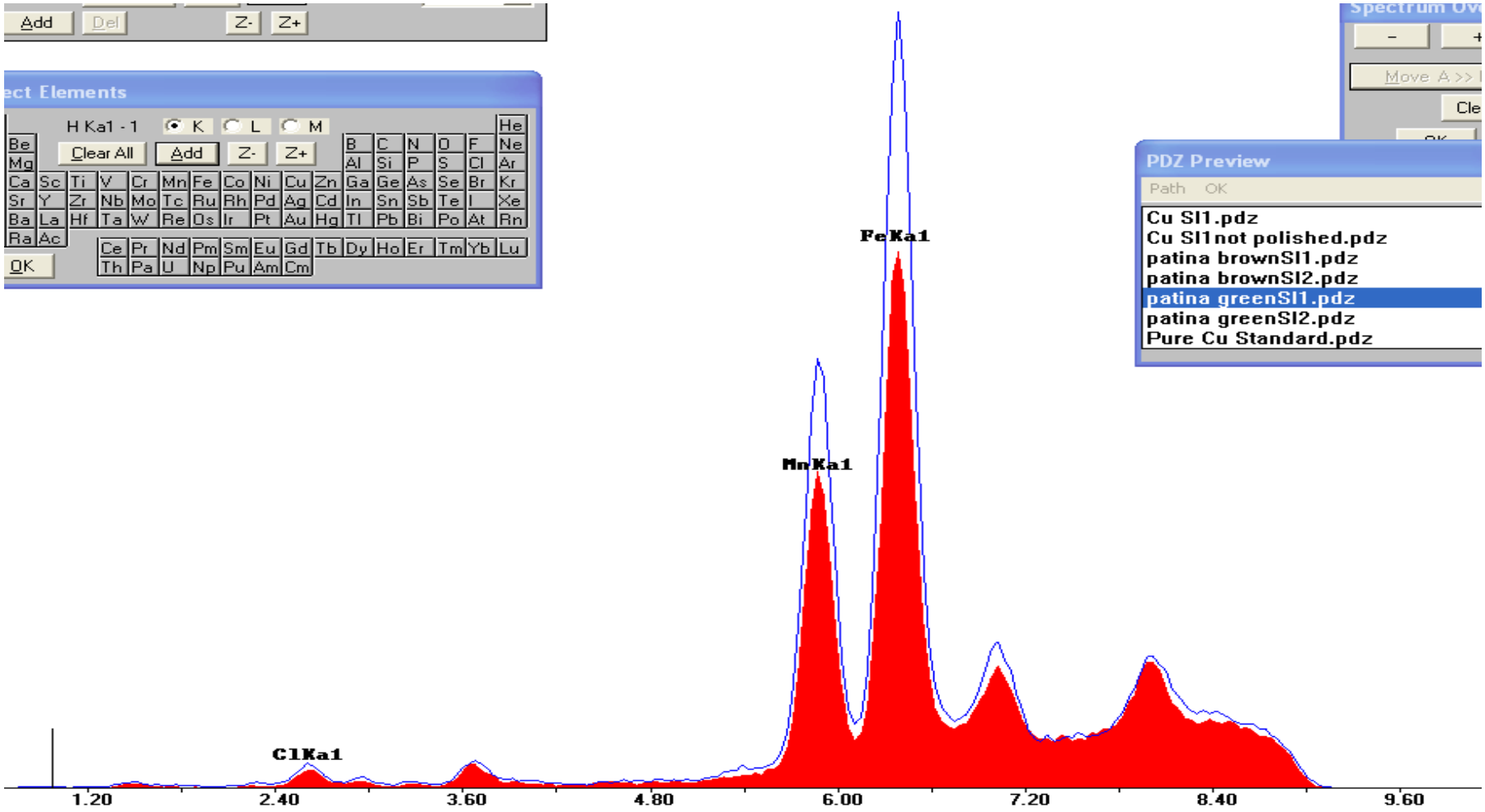
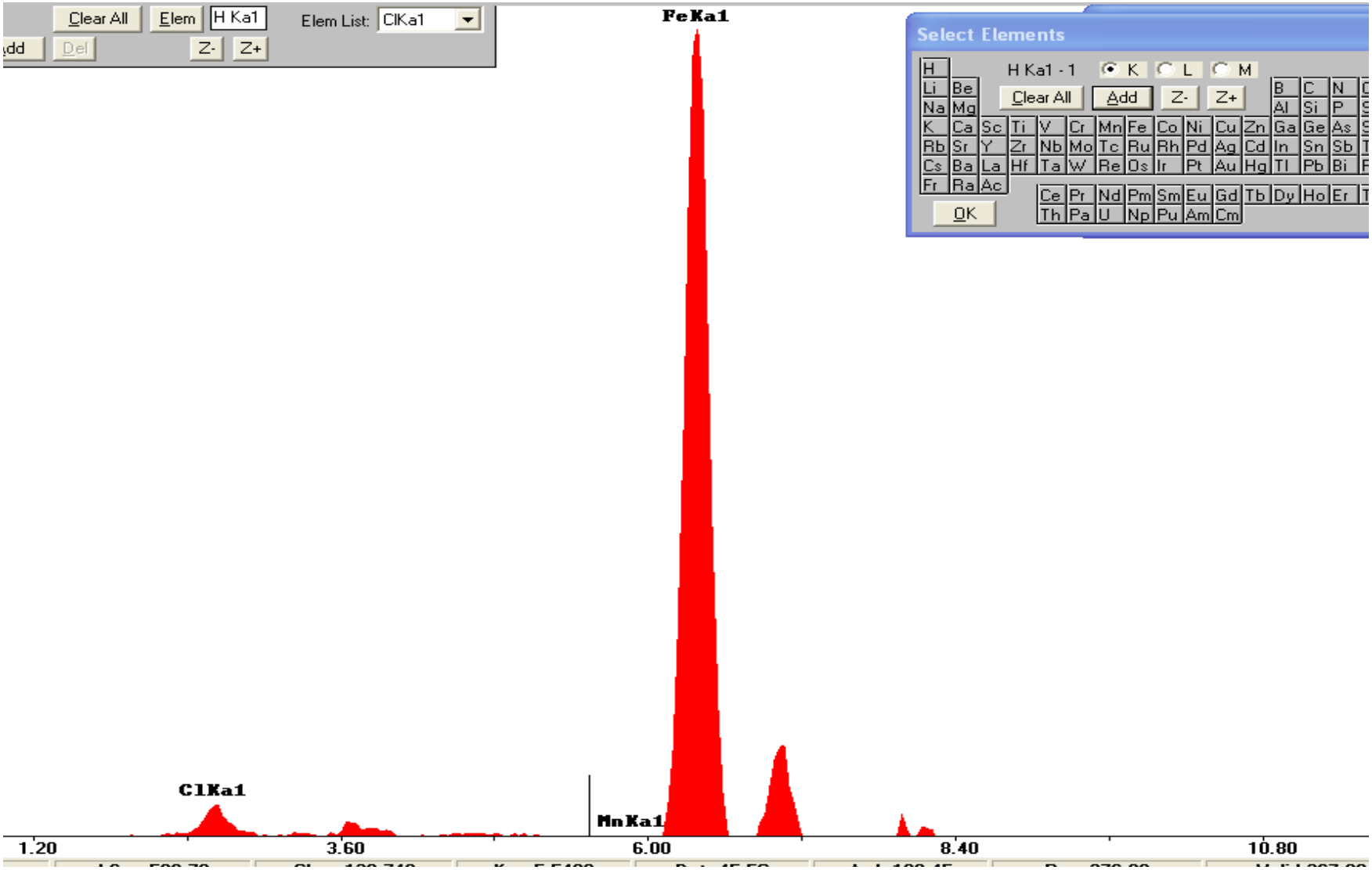


Brown patina

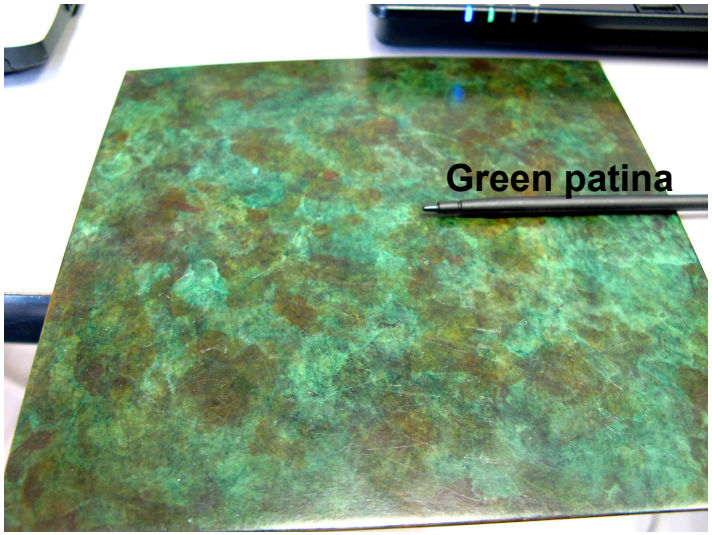
<u>patina brownSI1 (red) /Cu SI1 (blue):</u> Cu SI1 is the polished spot on the back of the plate, pure alloy. It is clear that the patina contains a large amount of Fe and some Cl. The red spectrum is the brown patina spot shown in the above picture.

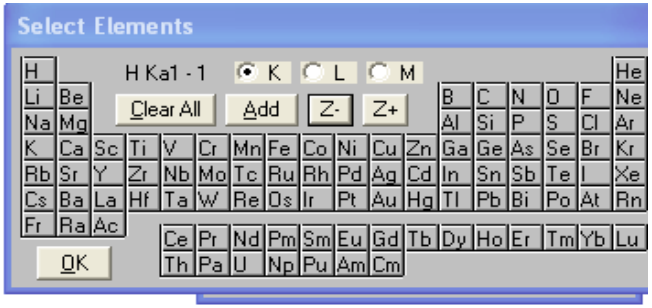


<u>patina greenSl1 (red) /patina brownSl2 (blue):</u> the green patina area is 30% less intense that the brown patina, this seems to indicate that the brown patina is thicker that the green area.



This is the difference between the brown patina and the polished back of the SI Cu sheet. Clearly the patina is composed of Fe and Cl





This is the difference between the green patina and the polished back of the SI Cu sheet. Clearly the patina is composed of Fe and Cl