

First analytical data on the frescoes from Novgorod

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View of Veliki Novgorod, river Volkhov and Lake Ilmen



Фотография А.А. Кочевника



- The Cathedral of St. George (Georgievskii Sobor) in the Yuriev Monastery was built in 1119
- The frescoes recovered on the excavations date to 1120-1130

Two views of the Yuriev Monastery





- Inside the church: the walls are decorated with later frescoes
- The older frescoes were found under the floor
- The lower level is now exposed

Some remains of the 12th century frescoes were preserved *in situ* under the floor



...and in the niches of the windows





Huge amounts of early fresco fragments were recovered in the excavations of the last 7 years, carried out by the Institute of Archaeology of the Russian Academy of Sciences, Moscow

The frescoes will be recomposed by skillful restorers



Our team studies pigments, mortars, substrates etc.



Many fragments bear inscriptions that correspond to and complete entries in the chronicles of the time



The quality of the paintings is exceptional



Because of the large amount of materials, in this study we concentrated on fragments of two colors: blue and green in all their nuances





- For comparison we are working on the frescoes from other churches as well
- The earliest one is the Church of the Annunciation on the Rurikovo Gorodišče, built in 1103, now a museum
- The frescoes are dated to the same period

Фрагменты живописи
Ц. Благовещения на Городище



A small selection
of blue and green
samples from the
Gorodišče church



- The second church we use for comparison is that of Our Saviour on the Neredita Hill, built in 1198
- The frescoes are dated to 1199
- In this way we cover the entire century and will possibly be able to distinguish the evolution in technique and pigments

- In this case part of the frescoes are *in situ* and have to be analysed in the church

- Three different phases can be distinguished





- For the first screening we employed a portable Bruker Tracer 5i (energy dispersive X-ray fluorescence)
- The aim was to distinguish the pigments employed for the various blue and green nuances

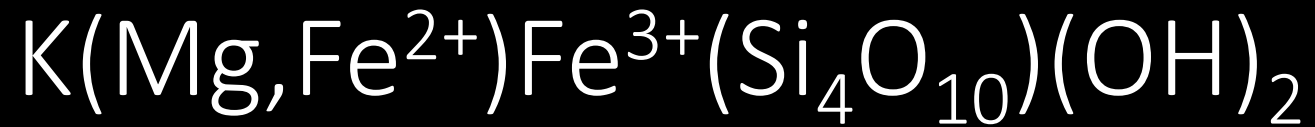
We already have rather interesting results



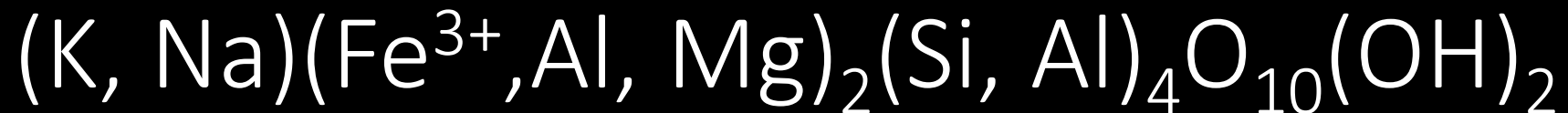
- For the green color the painters seem to have mostly employed green earth:
$$\text{K}(\text{Mg}, \text{Fe}_{2+})(\text{Fe}_{3+}\text{Al})\text{Si}_4\text{O}_{10}(\text{OH})$$
- Inside the intonaco we found the imprints of vegetable materials (straw) and brick fragments

Green earth consists of powdered green stones:
celadonite and glauconite

i.e.



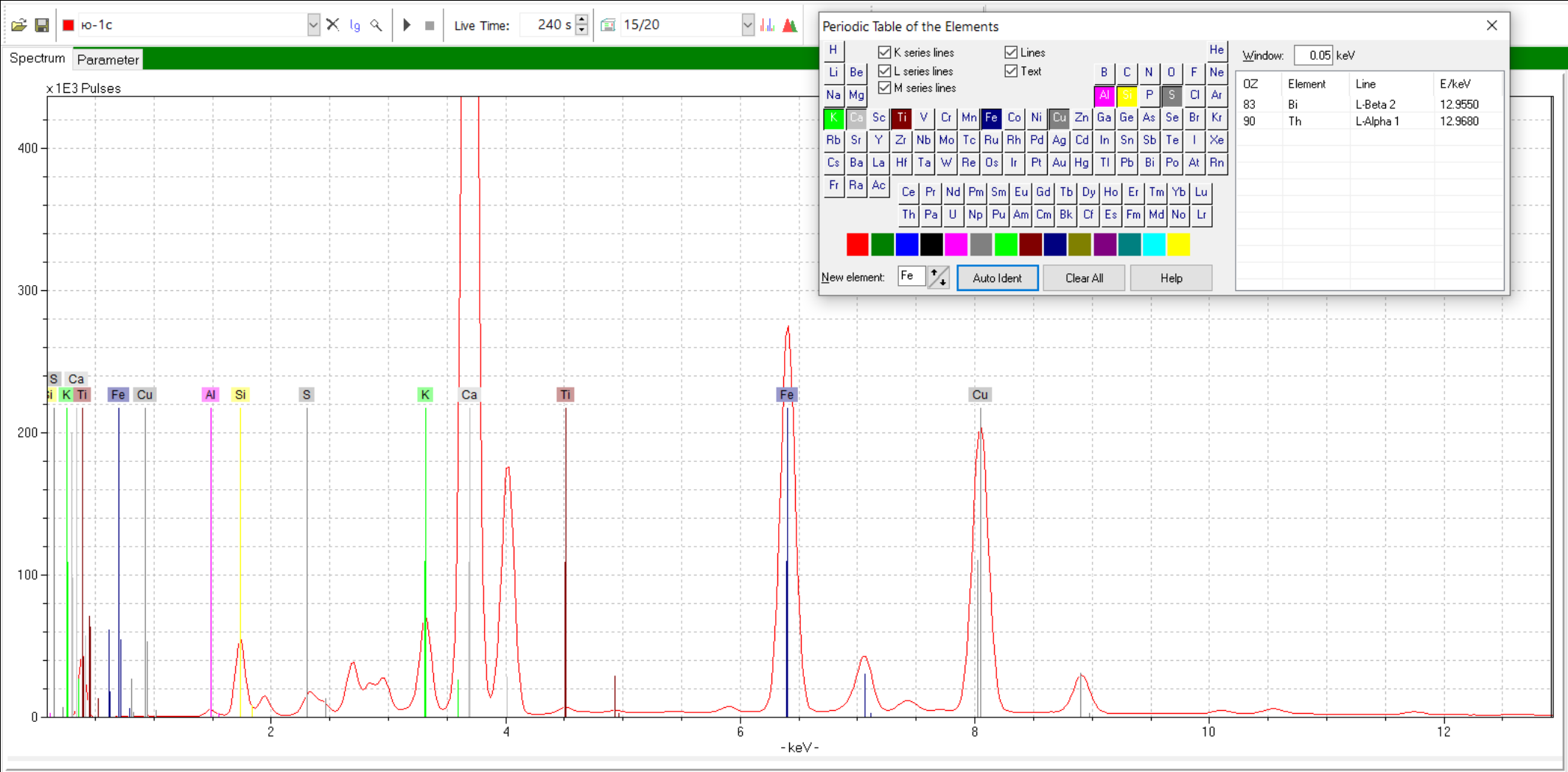
and



- To obtain different nuances the painters employed various mixtures
- Dark green also contains some manganese
- For light green, green earth was mixed with white calcium carbonate



In one case we identified some copper carbonate mixed with green earth



In a second phase we will mount some samples in resin, polish them and study the stratigraphy at the SEM

We hope to find out:

- Whether the pigments contains celadonite and/or glauconite
- In which form the manganese was added to the pigment
- How the calcium carbonate was applied or mixed, i.e. whether or not in this case we are dealing with «a secco» painting

The blue pigment consists of lazurite, i.e. lapislazuli
 $(\text{Na,Ca})_8(\text{AlSiO}_4)_6(\text{S,SO}_4,\text{Cl})$

This was the most precious and expensive pigment

The main source was the region Badakshan in Afghanistan

However lazurite is also mined in Siberia at Lake Baikal. We might be able to determine its origin

Medium blue pigment



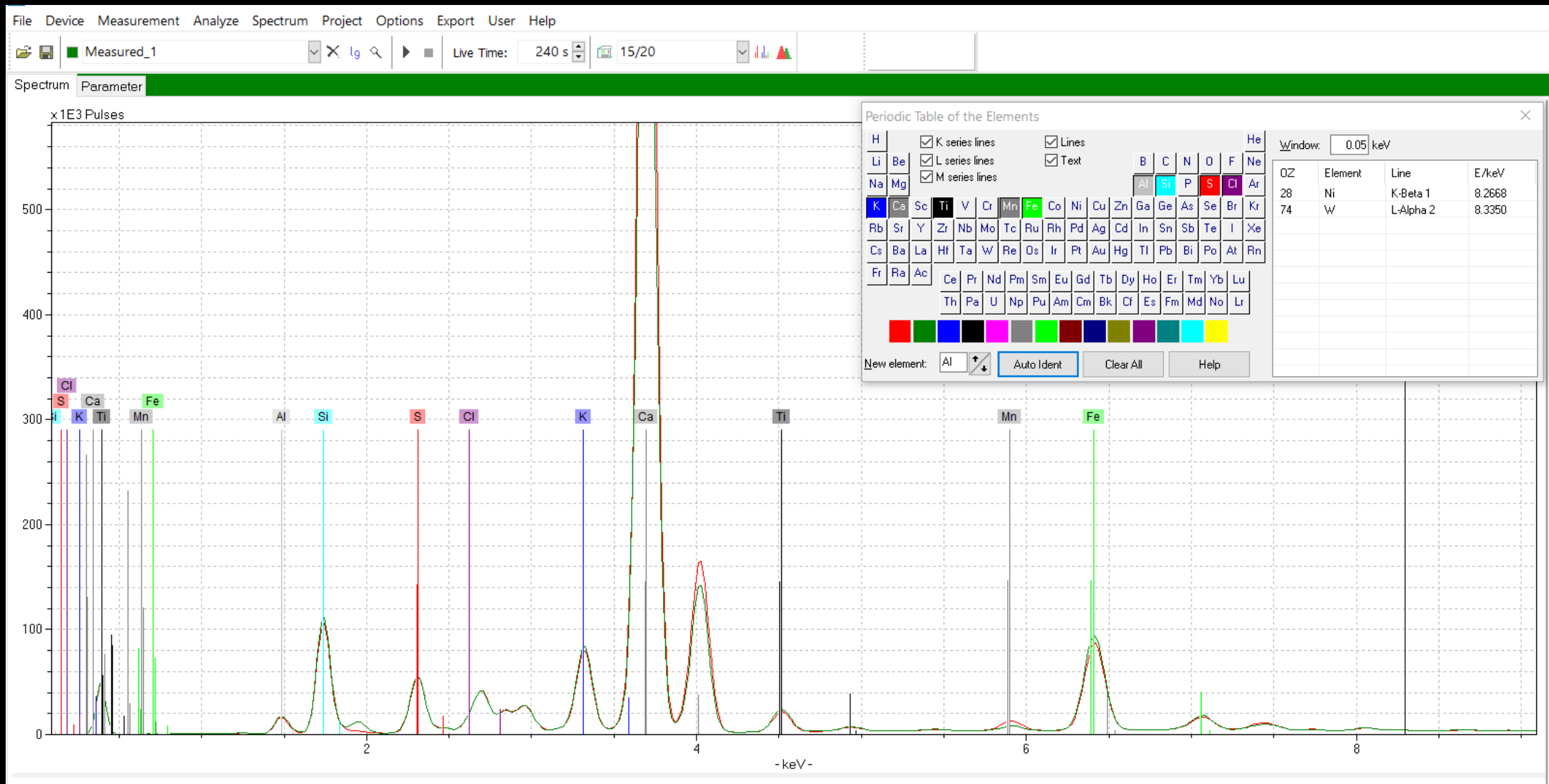
- Apparently lazurite, in this case not mixed with other coloring agents
- Interestingly, there are dark blue particles inside the intonaco
- SEM examinations will tell us what they are



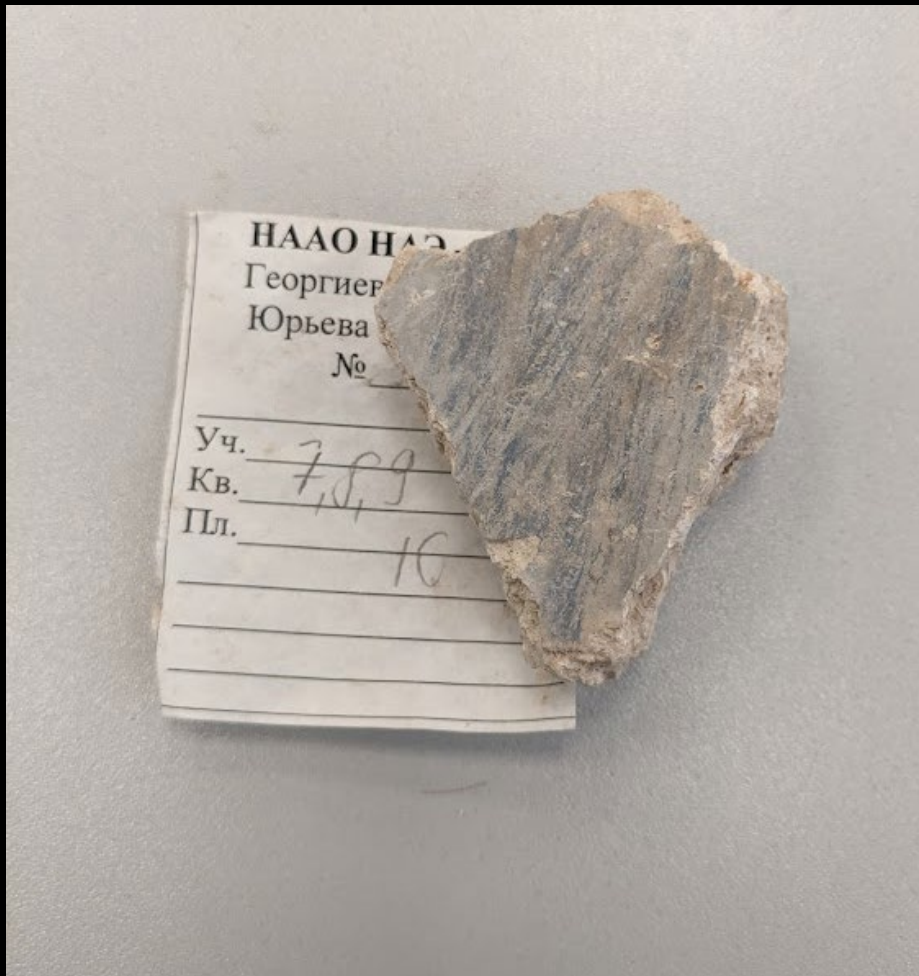
10-8

Example of dark
blue lazurite
pigment, mixed
with some Mn
and Fe

The XRF measurements show some Mn and Fe



Light blue specimen



- As with green, the lighter color was obtained by adding calcium carbonate
- Further studies will show in which form (lime, powdered limestone, marble etc.)
- The section will show if the white was added «a secco»

- Up to now we analyzed around 130 pigments, both from unearthed fragments and *in situ*, from the three different churches
- We are still at the beginning, but we intend to determine whether different compositions were used in the various churches
- To do this we will use SEM-EDS and XRD



Thank you for
your attention!