

MicroXRF analysis of banknote



XROS MF30 – laboratory x-ray microscope-microprobe for studies of the objects by the methods of the optical microscopy, radiography, local element XRF microanalysis with possibility of the element mapping. Using a microscope, a sample of up to 400 mm in size along the Y axis and of unlimited size along the X axis (max. scan area 150×150 mm; in the case of a larger area, the scanned areas can be stitched) and up to 105 mm high can be performed.

An overview video camera and two optical microscopes with magnification up to 200 times are using for accurate determination of the scanning area.

The central optical microscope with automated sharpness adjustment is combined with the axis of the microprobe (axis of the x-ray beam).

Local X-ray fluorescence microanalysis with the possibility of elemental mapping and X-ray studies can be carried out both separately and simultaneously.

Sample positioning accuracy is 10 microns.

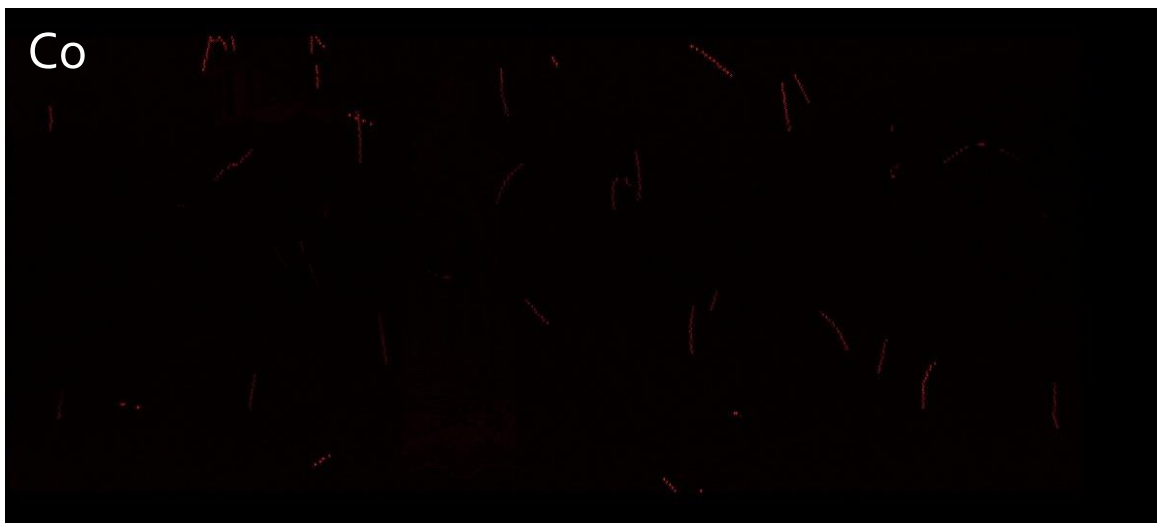
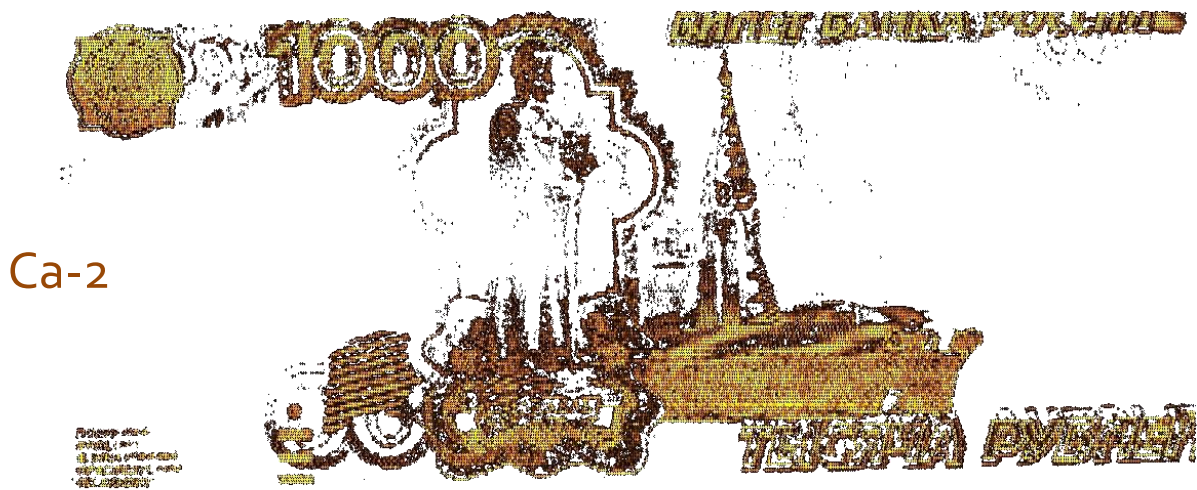
The minimum diameter of the x-ray probe is 30 μm.

The range of simultaneously measured elements from ¹¹Na to ⁹²U.

Samples: banknote with a nominal value of 1000 RUB.

Size of scan area allows to investigate all the banknote in one scan without moving the sample.

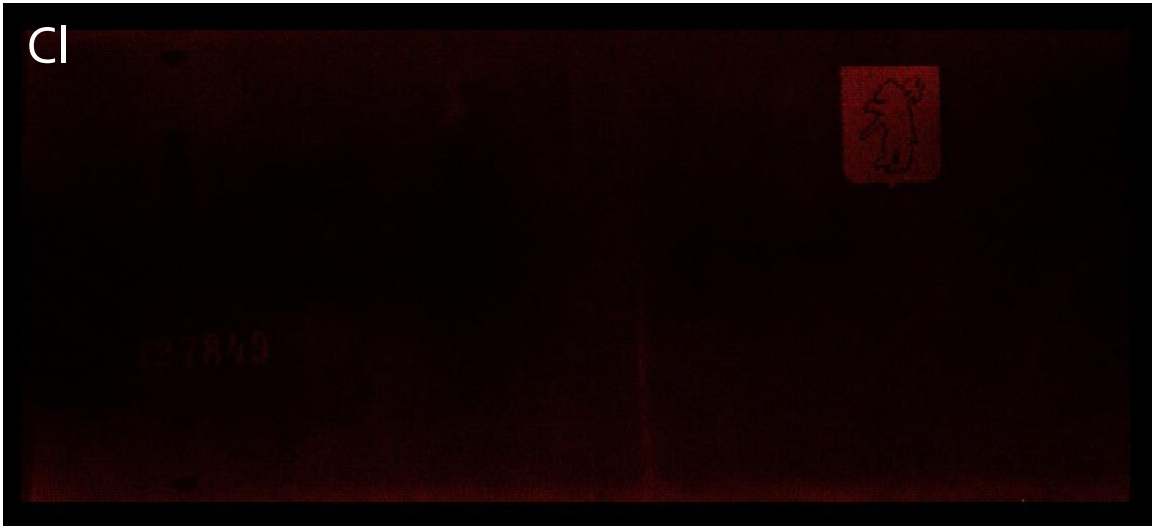




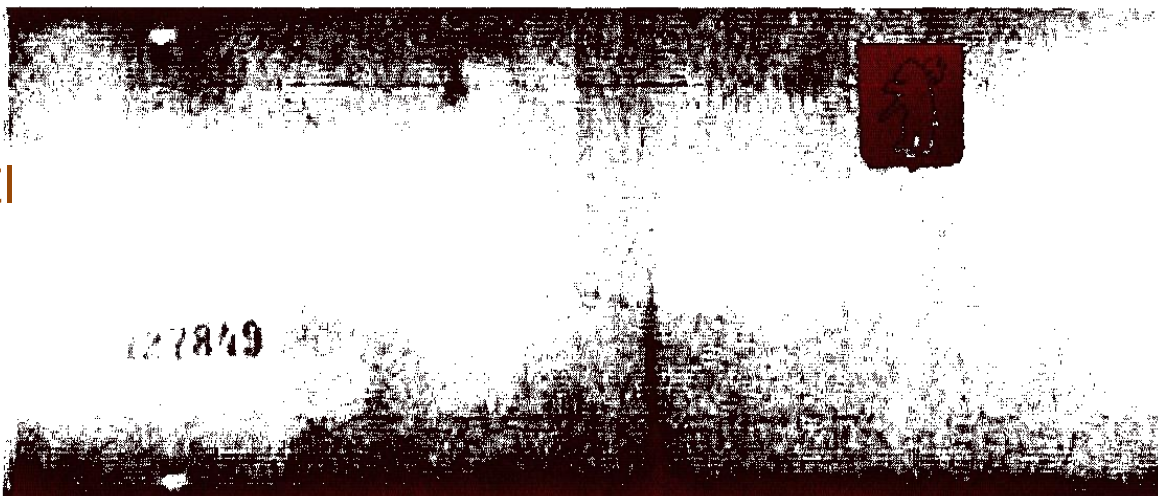
Co

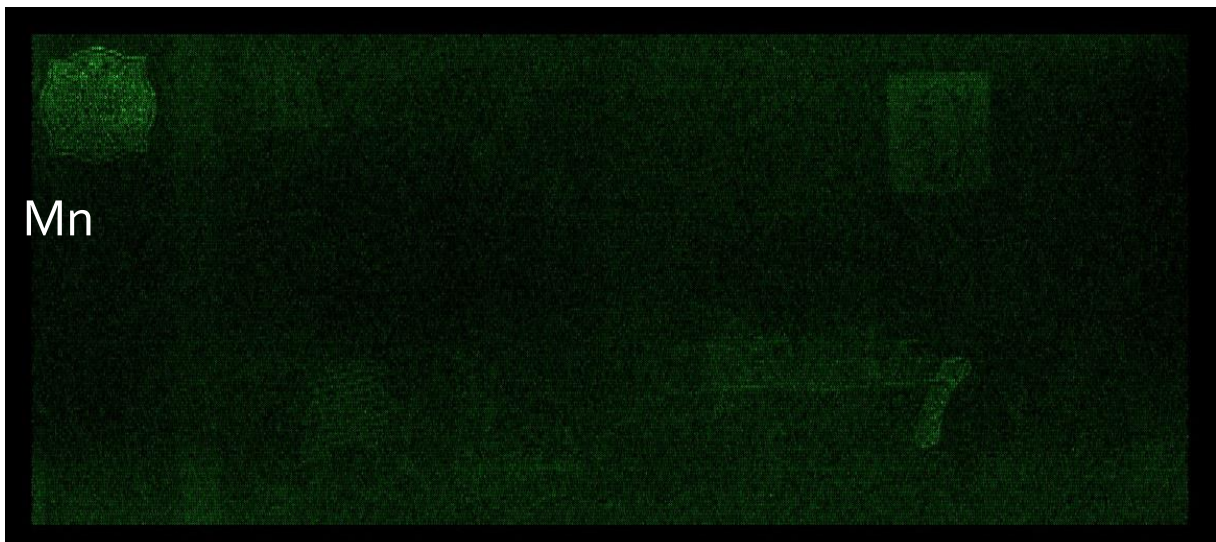
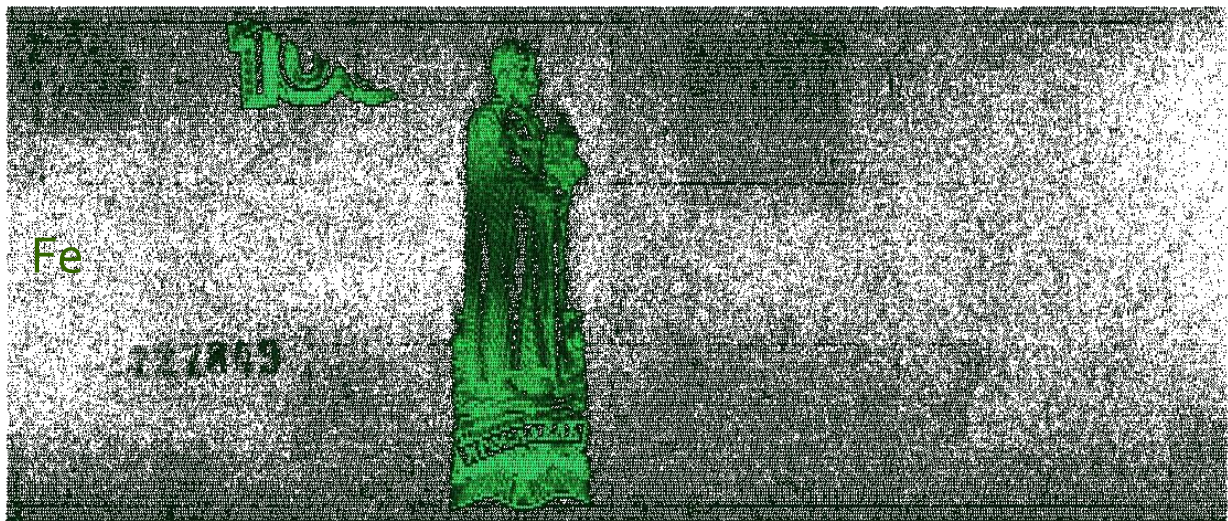
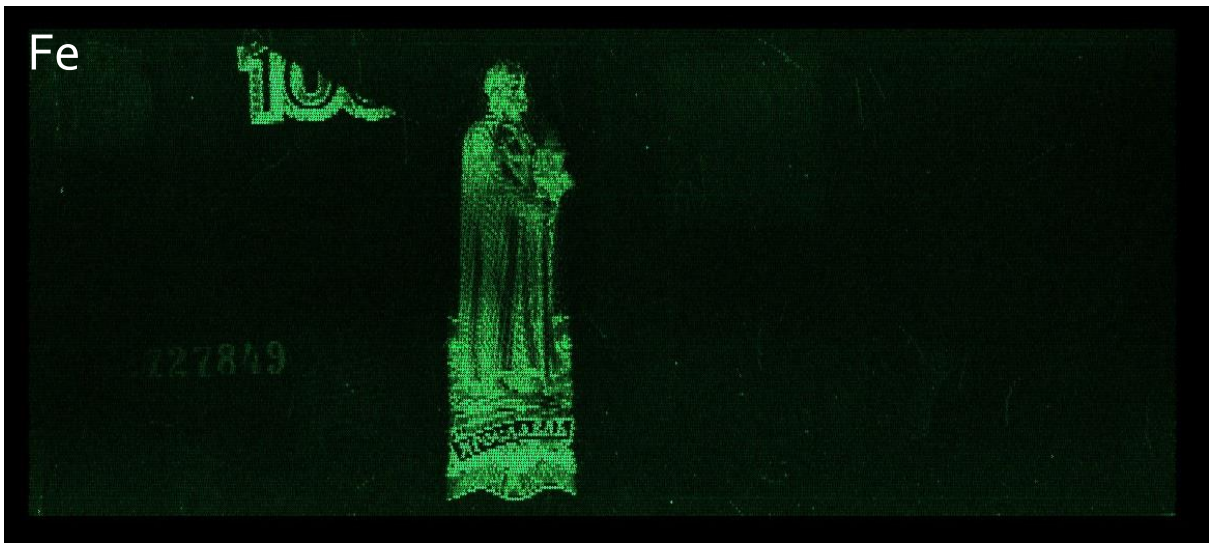


Cl

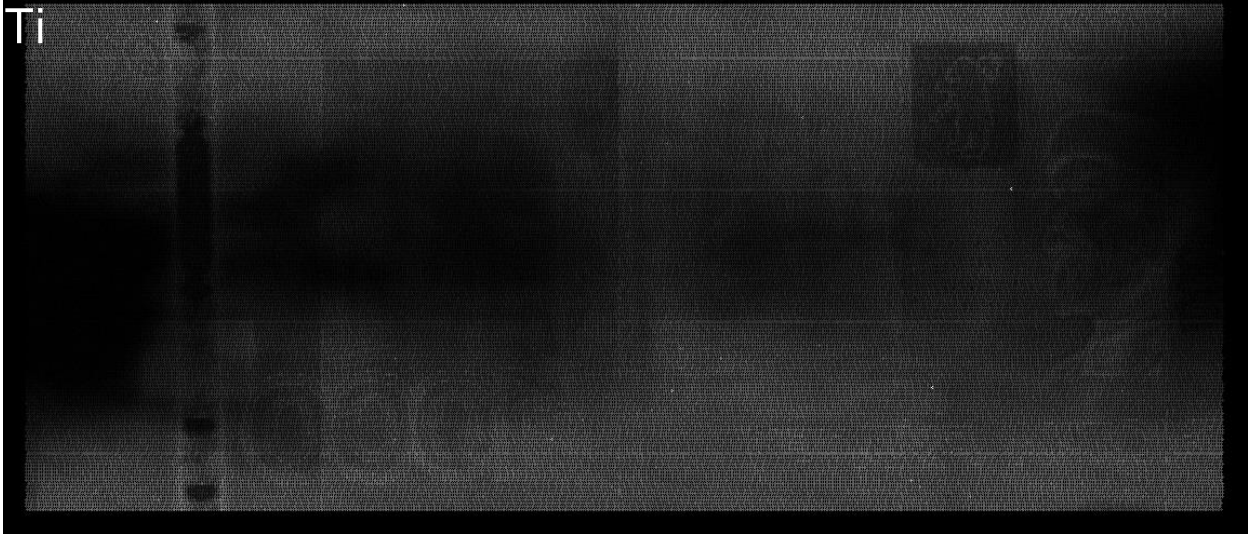


Cl

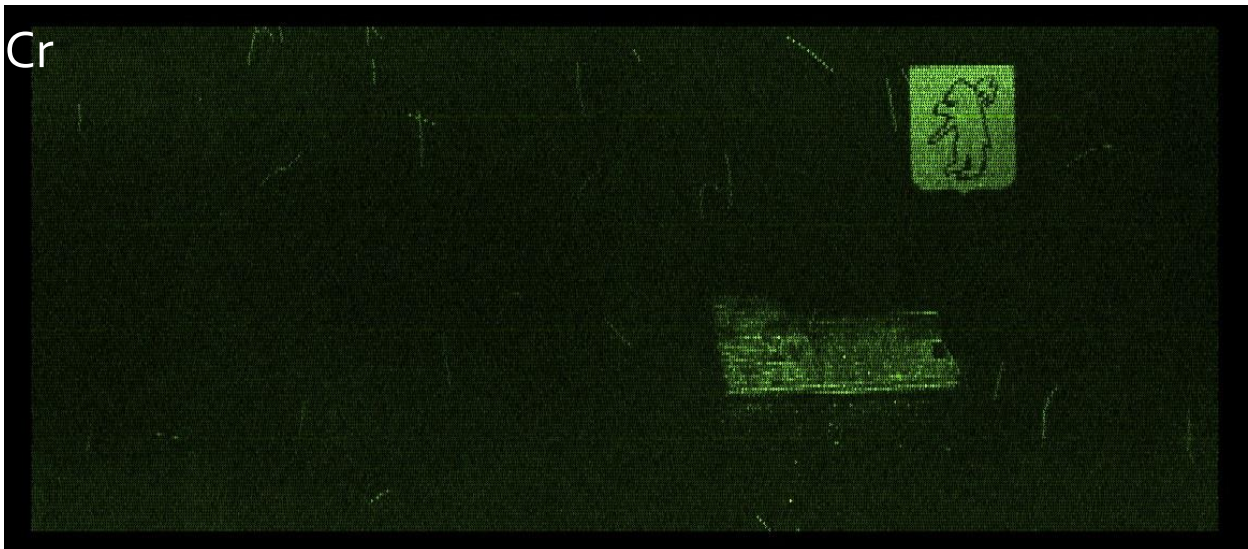




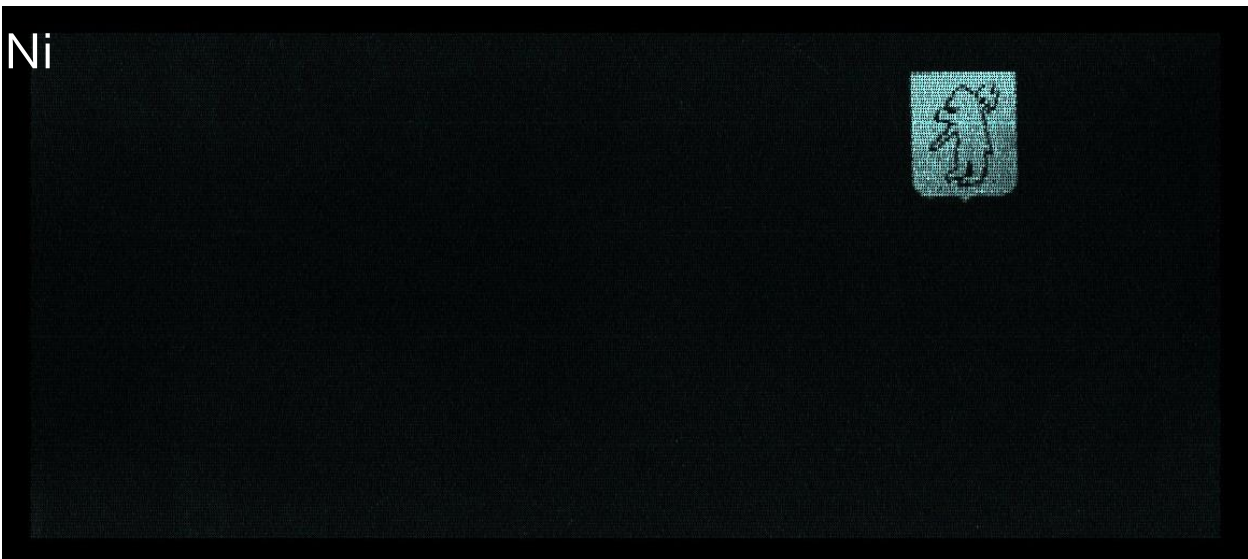
Ti



Cr



Ni



Conclusion

As a result of investigation the presence in the banknote material (paper) of non-uniform distribution of such elements as Cl, Ca, Co, Ti, Mn, Fe, Ni, Cr was detected.

XROS MF30 x-ray analytical microscope-microprobe allows to analyze the material of banknotes for the distribution of various elements in it with a high spatial resolution and elemental sensitivity.

It is possible to identify counterfeit currency units comparing the results with reference samples of banknotes.

Parameters of measurements:

Scan step	400 μm	Electric current	7 000 μA
Scan rate	400 $\mu\text{m/s}$	XRT	Mo anode
Measurement time	1 000 ms	Atmosphere	Air
Voltage	30 kV		