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Stratigraphy of the wooden painting utilizing back scattered photons

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Aim of the presented work is investigation of the wooden paintings (and medieval sculptures decorations) which is based on so-called polychromy. Polychromy consists of several layers in a variety of colors and elemental composition. It is also common that such artifacts have been renovated several times. Therefore, it is highly desirable to investigate the current status of existing polychromy.

It will be presented that x-ray back-scatter imaging can be utilized for exploration of the 3D depth profile of surface layers. Such technique can be applied regardless of volume of the object behind the investigated structures, as it was shown in [1] during investigation the honeycomb structure.

Experimental work was done with sheet shape beam with thickness 0.1 mm irradiating sample under low angle (6 Deg). Pinhole camera with single photon counting detector observing signal from the side (detector parallel with X-ray beam), see figure left for whole setup and top right for camera arrangement. Registered signal depends on scattered and XRF photons and drop down of the signal intensity is related with layer thickness, see figure right bottom. It was analysed in that color layer laying on the 10 mm thick wooden plate has thickness 25 micrometers in accordance with the technology of the sample preparation.

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