DEVELOPMENT OF THE SKAT TEXTURE DIFFRACTOMETER

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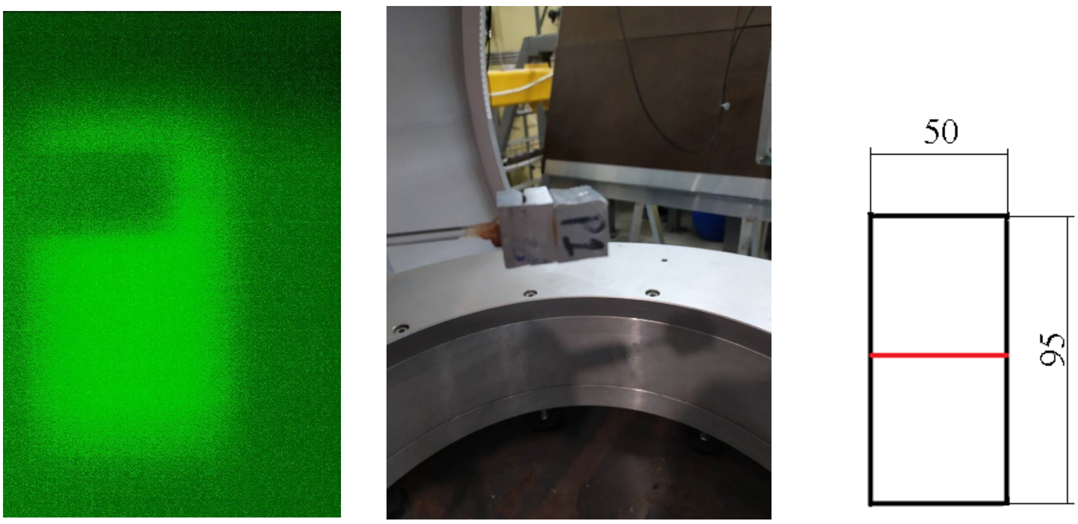
Texture diffractometer SKAT is fruitfully exploited since 1997 [1-3]. The present development of the instrument was motivated by a need to increase a number of samples to be measured. The main objective of the instrument to measure crystallographic texture of alloys, geological, biological samples and ceramics. The number of samples that were measured before reactor modernization exceeds the user demand. The diffractometer situated at the IBR-2M beam line 7A-2. The beam cross section it this beam line is 50 by 95 mm. Typical sample size is from 30 to 50 mm in all dimensions, so it can be effectively split into two parts. Fortunately, large beam cross section allows to install the second ring for simultaneous measurements of two samples. A compact system for neutron radiography was used to obtain a neutron image of the profile of 7A-2 beam line. The scintillator 6LiF/ZnS converted the neutron image into an optical one, which was detected by a highly sensitive CCD cameraVIDEOSCAN-11002-2001. The dimensions of the scintillator up to 200 mm make it possible to obtain a complete image of the neutron beam and detect the position of the sample in it. Figure 1 illustrates the possibility of a sample positioning in the instrument.



a) b) c)

Figure 1 a) shadow of the Al with Gd sample placed at the first ring shown in b). c) The neutron beam cross section.

Neutrons scattered at a sample are registrated by detectors situated at the same angle of 90º. Detectors are positioned in a way to have regular 5 by 5-degree greed on a sphere. The distance from a sample to detector is one meter. The distance between samples is about 60 centimeters. There are 19 detectors based of ^{3}He counters with soller collimators at each ring. One ring is equipped with 29´ angular divergence collimators, another ring with 43´ angular divergence collimators. During the modernization of the spectrometer, new ^{3}He counters and preamps were installed. Compared to the old set of detectors, this significantly increased the efficiency of the spectrometer. For independent operation of the two detector systems, each is equipped with its own MPD-240 data acquisition system [4] and has its own control computer. The MPD-240 DAQ systems are clocked by a common reactor start signal corresponding to the periodic neutron pulse at the output of the IBR-2 reactor cold moderator, with a frequency of 5 Hz and a duration of 2 μs. Therefore, the time counting for each event in both detectors starts at the same moment with a time resolution of 16 ns.

Important question is connected with mutual influence of the samples on the measured spectra. To assure the absence of the mutual influence, two powder samples of different materials were measured simultaneously at different positions and rings. One sample was aluminum with cerium and another was mixture of calcite and aragonite. Figure 2 displays the results of such measurements. One can clearly see that each spectrum is not affected by the other one. This becomes possible due to presence of the soller collimators in front of detectors. They effectively transmit just those scattered neutrons that are at the angle of 90º.

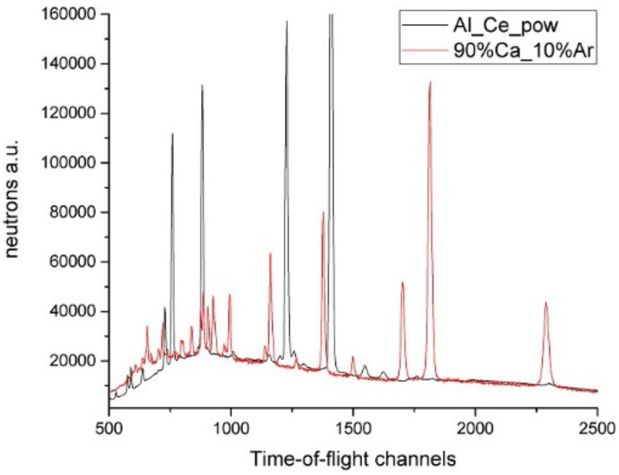


Figure 2 Two simultaneously measured powder samples.

It is necessary to mention that new preamplifiers as well as other electronics was updated. Sonix+ software package [4] is used for data acquisition and data storage for both rings independently. Measurements of the same samples at different rings to be presented and discussed. Besides, the present development of the instrument allows increase almost four times the output of the instrument.

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