Contribution ID: **758** Type: **Oral**

Non-destructive testing of materials at the TITAN neutron imaging facility of the WWR-K research reactor

Wednesday, 11 November 2020 15:15 (15 minutes)

In 2019, a new experimental station TITAN (TITAN - "Transmission Imaging with ThermAl Neutrons") was put into operation at the research reactor WWR-K (Institute of Nuclear Physics, Ministry of Energy of the Republic of Kazakhstan, Almaty, Kazakhstan) to conduct research on non-destructive testing of materials using neutron radiography and tomography. The neutron radiography and tomography unit is located in the horizontal channel No. 1 of the WWR-K research reactor.

At this facility, a neutron beam with dimensions up to 200*200 mm is formed by a collimator system and an evacuated tube to reduce the intensity loss due to neutron scattering in air. The characteristic parameter L/D is determined by the ratio of the distance L between the entrance aperture of the collimator system and the sample position to the diameter of the entrance aperture of the collimator D. The corresponding values for the created setup are L=7 m, D=2 cm, which corresponds to the value of the parameter L/D=350. This value is at the level of similar installations in other world neutron centers. Additionally, a system for varying the diameter D of the entrance aperture of the collimator system from 5 mm to 90 mm was installed, which will allow operation in a wide range of the characteristic L/D parameter from 75 to 1400. A special detector based on a two-mirror optical scheme is used to obtain neutron radigraphic images. The neutron beam passing through the object under study is transformed into a light signal using a scintillation screen, which is focused by a variable focal length lens onto the CCD-matrix of a high-sensitivity video-camera.

This report will describe the current state of the TITAN facility and recent applications to materials science work.

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Session Classification: Applied research

Track Classification: Applied Research