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Recent Instrumentation Upgrades on the Residual Strain/Stress Diffractometer at NPI-Řež

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Abstract: The two-axis diffractometer SPN-100 installed at the research reactor LVR-15 of the Research Centre Řež, is an instrument dedicated to macro/micro strain/stress scanning of polycrystalline materials [1, 2]. Very recently, the diffractometer has been equipped with a new two-dimensional position sensitive detector (2D-PSD) permitting to increase the acquisition of the data several times. For sample positioning, in addition to a previous standard x-y-z translation stage, a new six-axis robotic arm has been installed to allow more flexible manipulation of complex samples and automatisation of the strain/stress measurements. The latest experimental results obtained with the upgraded instrument are presented.

Keywords: Neutron Diffraction; Strain/Stress Measurements; Focusing Monochromator.

1 View of the instrument and the test experiment

The diffractometer has a changeable monochromator take-off angle and can be set and operate at a suitably chosen neutron wavelength in the thermal neutron range from 0.1 nm to 0.235 nm. In the case of α-Fe and γ-Fe samples it usually operates at the neutron wavelength of 0.235 nm, when providing a maximum detector signal and good resolution after diffraction on α-Fe(110) and/or γ-Fe(111) lattice planes. By installation of the robot system and the 2D-PSD the acquisition of the data has been increased by a factor of 4.

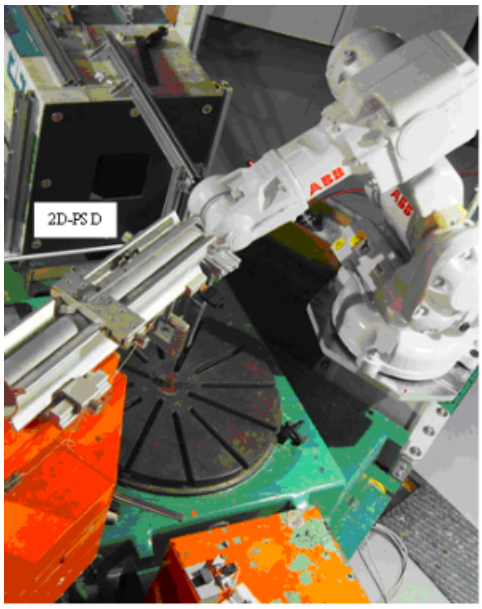

Fig. 1: Photo showing the ABB robot system and 2D-PSD detector.

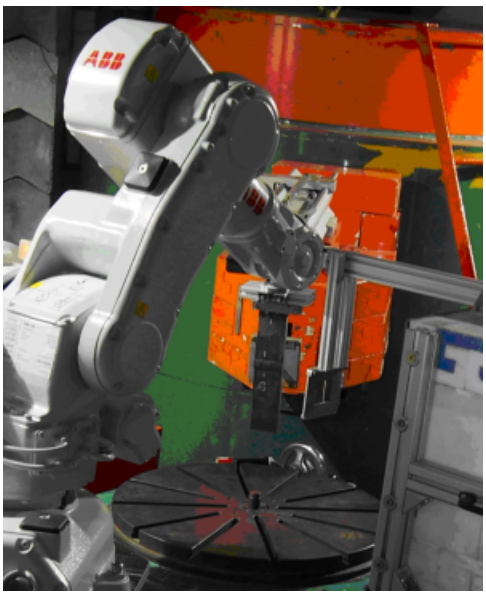

Fig. 2: Photo showing the detail of the test sample and the slits selecting the measurement gauge volume in it.

The photos of the basic components of the instrument as well as the first experimental results obtained on the welded test-sample are shown on the following figures. As a sample we used a 12 mm thick α-Fe

welded plate of the dimensions 234 mm (length) × 50 mm (width) × 12 mm (thickness). The thickness at the welding point was 15 mm. The weld area extended to approx. 10 mm on one side and 20 mm on the other side. It should be pointed out that the strain/stress instrument is opened to external users and the measurements can be free when a new proposal is submitted through CANAM-ACCESS project (see http://neutron.ujf.cas.cz/en/instruments/user-access/.

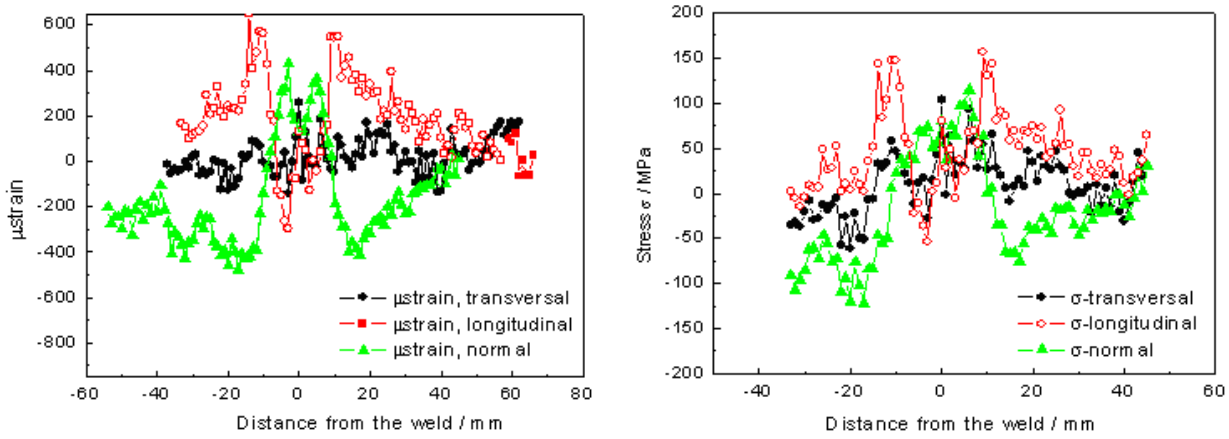

Fig. 3: The microstrains as well as stresses versus the distance from the weld as measured on the 12 mm thick welded α-Fe plate.

Acknowledgement

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