STRUCTURE OF MATERIAL OF REACTOR VESSEL FOR NUCLEAR POWER PLANTS: NEUTRON SMALL-ANGLE SCATTERING DATA

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In recent neutron scattering experiments the volume of metal of reactor vessel (anti-corrosive covering) has been scanned by a thin neutron beam (fragment of welded joint) to check a quality of welded joint and base metal. As it was found, the base metal contains mainly linear defects (dislocations). Meanwhile, the welded metal possesses very different defects' morphology.

The developed internal surface in metal specimen was observed by small-angle neutron scattering. The total area of the borders of submicron-size inclusions, $S_T \sim 10^4$ cm^2 (per cm^3), was estimated. In steels well deformed there was first observed a phenomenon of smoothing of internal surface nearby material breaking. This can be used to develop new effective criteria for the diagnostics using neutron scattering data to detect fine structural precursors of material crash. Neutron scattering data presented illustrate a feasibility of neutron methods for nanostructures' examination in metals. The following analysis of the relationship between the parameters of nanostructures and macroscopic strength characteristics should bring a firm base for the applications of neutron scattering methods for examination of materials and reliable prognosis of safety.