4.3.6. VISUALIZATION AND CONTROL THE INTERNAL STRUCTURE NANOCHRYSTALLIC TITANIUM AND ARTICLES THEREOF

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Creating a bulk nanostructured titanium and its products, primarily for medicine, is one of the priorities in implementing government programs in the field of nanotechnology and nanomaterials. Production of nanostructured titanium rods in the form of pure titanium by means of processing, the pressure, as well as the manufacture of its products, requires quality control at all stages of production, including the assembled product.

The essence of the X-Ray computational tomography (RVT) is to restore the distribution function of density in the cross-section of a weakening of the integral values of X-Rays along a family of rays. To get an array of integrated data object is irradiated from different directions and at different positions of the source – detector about the object.

In this paper, studies were conducted using a stationary X-Ray tomographic set of "Eagle".

The main features of the installation:

– visualization of a layer of control by digital laminografii;

– highly mikrofokusny source of radiation;

– digital X-Ray converter with high spatial resolution;

– a separate block for mikrofokusnoy tomography designed for the software "Dyada";

– there is an opportunity to study the internal field in the video preview. After the reconstruction of all the sections of program images are processed and produced live video of sections throughout the depth of the object.

Fig. 1 shows a sample of nanocrystalline titanium artificial defect and its 3D model. The defect is a fatigue crack with a secondary disclosure of 50 microns. Reconstruction of a layer allows you to determine the location of bedding fractures in the rod, as well as its size.

Horizontally oriented defects (cracks, sunsets, bundles, etc.) that arise in the processing of bar pressure, with the disclosure of more than 10 microns effectively detected ultrasonically. When the thickness of a rod of square cross-section of 6 mm at a frequency of 5 MHz confidently identified bundle cracks to the disclosure of more than

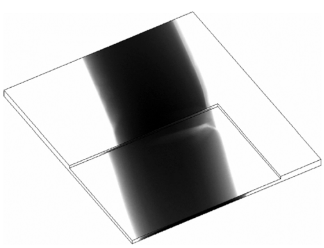

Fig. 1. Fatigue crack in a rod of nanocrystalline titanium, 6 mm thick

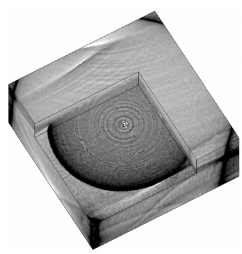

Fig. 2. Distribution of density in the cross section bar of nanostructured titanium

10 microns and with an equivalent area of > 2 mm^2. Approximately the same sensitivity can be controlled not only the elements of the finished product, but its build quality. At the same time using the RVT and ultrasound controlled geometry, quality of assembly defects of different orientations, resulting in the assembly of the finished product. 3D reconstruction can also visualize the heterogeneity of the density distribution in cross section, the nature of which is determined by the size and direction of forces acting in the broach bar. Studies show that most homogeneous metal under the surface. With increasing depth there are periodic symmetric compression and rarefaction, a step which increases with depth, fig. 2.

This shows the uneven distribution of forces on the cross section bar in handling pressure. As the depth of actors external shielding layers. It is therefore most likely to defect in the processing pressure persisted in the central part of the rod, which raises the question of improving the technology of pressure.

Perhaps the process of broaches the pressure should be combined with exposure to the powerful core of ultrasound, the base structure of the material.

Thus, the X-Ray computer tomography and ultrasound controls allow the creation of an efficient technology for integrated quality control nanostructured titanium and articles thereof.