Annotation of the graduate work of 6th-year student A.S. Voronov

X-ray investigation of periodical and nonperiodical systems with small layer thickness.

Rapid progress in different technological areas becomes possible significantly because of structure investigation of matter with increasing exactness. X-ray studies are the most informative and sometimes the only available technique to perform such investigations. Success in x-ray matter structure studies are significantly connected with creation of third generation synchrotron sources, which poses high brightness and power of the beams. X-ray optical elements are widely used for guiding and forming synchrotron beams and metrological methods of production and postproduction X-ray optical elements control are getting more and more important. It seems logical to use X-ray radiation with the wavelengths similar to the typical irregularity sizes of x-ray optical elements in control. In our case it is hard X-ray region (wavelength equals angstroms by the order of magnitude).

In this work X-ray optical elements control method was performed. Laboratory diffractometers and X-ray tubes as a source of X-rays are used. After the improvement of setup automotive proceeding of the experiments became available.

Samples of X-ray multilayer mirrors and their separate substrates were studied using methods of X-Ray srattering. It is revealed that for all investigated mirrors interlayer roughness are not independent and are partly correlated from layer to layer. Proceeded investigations make it possible to state that there are layers with changed density about 5 Angstrom thick on every separating bound.

Calculation of inverse problem and inner structure reconstruction using two independent methods and different assumptions are performed using the received data. Different methods reconstruction results are compared for one of the X-ray mirrors and it is shown, that they are alike.