4.3.4. APPLICATION OF THE INTERFERENCE RESEARCH TECHNIQUE OF A SURFACE FOR QUALITY ASSURANCE AND SCINTILLATION CRYSTALS AND MICROELECTRONICS PRODUCTS

Buller A.I., Moskalev J.A., Kuleshov V.K., Tomsk Polytechnical university,
Scientific research institute of Introscopy, Tomsk, Russia

Now in connection with development of methods of not destructive testing more and more actual there are examinations of performances of scintillation screens and microelectronics products. [1]

In developing of scintillation screens of one of the primary goals the magnification of contrast of the image and magnification defectoscopy sensitivity is. Generally these performances are spotted by homogeneity of a scintillation course and presence of structural flaws.

For scintillation screens on the basis of monocrystal CsI (Tl) and $CdWO_4$ sensitivity and contrast of the image are spotted by quality of a polish of a surface. Thus for maintenance of sensitivity of 0.5–1% quantity of structural flaws on a screen surface should not exceed 0.5–1 μm.

In this connection there is an actual problem of technological quality assurance of surfaces of scintillation screens in the course of their manufacturing and examination of the parents of occurrence of structural flaws.

The given problem can be solved by means of optical interference microscope NewView 7300.

Optical interference microscope NewView 7300 uses white light which part is guided on the solid-state data unit for half-tone picture build-up for scanning of a surface, other parts of the light are guided on an interference for measuring of micro-structure and surface build-up in three-dimensional space without contact to the explored sample.

This device it is possible to explore practically any the sample with a reflectivity from 1 to 100% to and to register features of a relief from a roughness nanometer gauge to steps of millimetric height. The resolution on a normal line to the sample for an optical interferometer makes the tenth shares nanometer (~0.1 nanometers on a vertical). The gained graphic representation with the high resolution, allows to analyze performances of structural surfaces precisely [2].

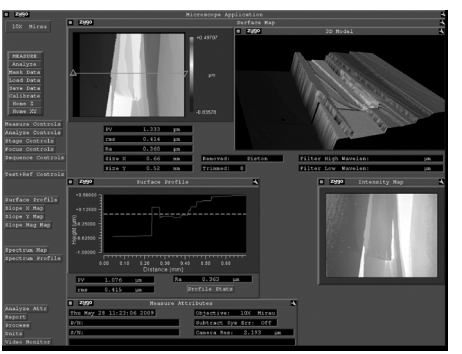

Fig. 1. Structure of the monocrystal scintillation screen with difference of heights on a surface to 1 μm

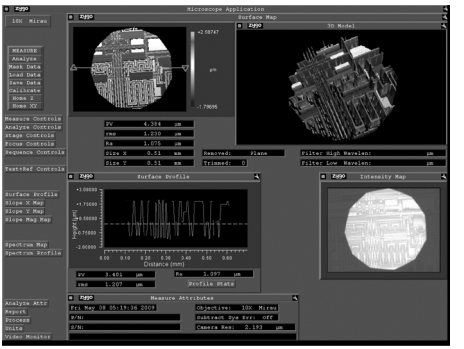

Fig. 2. A microcircuit with steps of metallization of aluminum

Tridimentionality of measurings is reached by vertical measurings with use interferometry and horizontal measurings of a surface calculated of the sizes of pixels of the solid-state data unit. Thanks to the newest software of system, the raised accuracy and efficiency of the control is provided. Observed datas are represented in the form of images of surfaces, diagrammes and numerical values of parameters of surfaces, such as Ra, Rz and etc.

One more of advantages of the given device is the control of surfaces of the big area. Depending on a used lens the size of grasped field of object varies from 7.04× 5.28 to 0.07 × 0.05 mm (accessible lens 1, 2, 2.5, 5, 10, 20, 50 100 multiple magnifications), but thanking stitching images with the sample the examination area is incremented by software product and completely motorised travels of a accrue to table to 140 × 100 mm.

The example of examination of quality of a surface of the monocrystal scintillation screen on the basis of $CdWO_4$ is given in drawing 1. By results of examination it is erected, that by means of an optical microscope the size and the shape of surface defects influencing quality of the image gained on the scintillation screen.

Also the control of the worker of surfaces of products of a microelectronics is rather effective. In fig. 2 the structure of a surface of a microcircuit with steps of metallization of aluminium is presented, to them erect certain requirements on drawing height.

References:

1. **Buller A.I., Moskalev J.A., Kuleshov V.K.** Research of dynamic characteristics of scintillation screens, State-of-the-art technics and technology: Collection of works of XVth International scientifically-practical conference of students, post-graduate students and young scientists. Tomsk, TPU, May 4–8, 2009. – Tomsk: Publ. TPU, 2009. – t. 1.

2. **Klyuyev V.V., Matveev V.I.** Not destructive testing and diagnostics nanotechnology and nanomaterials // Control. Diagnostics. 2007. – N 10. – P. 3–13.