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OPTICAL METALLOGRAPHY .OPTICAL METALLOGRAPHIC MICROSCOPES

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Abstract
Familiarity with the general structure, optical system and different types of optical metallographic microscopes, quantitative metallography, structure of metals, methods of finding the amount of grains and the size of grains on a scale, standards used for details, capabilities and magnification levels of metallographic microscopes, and defects when working with them the image is widely illuminated. Objectives and eyepieces for metallographic microscopes, basic methods of microscopic studies, types of microscopes are given information.

Basic word
Quantitative metallography, grain size, objectives and eyepieces, fluorescent, ultraviolet, polarizing, interference microscopes, biological, electron, metallographic microscopes.

Enter

A microscope is an optical instrument that magnifies microparticles, very small objects that cannot be seen by the eye. the first microscope was invented by G. Galileo in 1609-10, and the calculation of a complex microscope was invented by E. Abbe in 1872. A microscope uses a spherical lens glued together and an achromatic lens corrected for coma (image distortion) as an objective. The microscope uses not a multi-lens objective, but an immersion objective in which a special clear liquid is poured between the two lenses. In an immersion lens, light scattering is reduced. The microscope lens used in the ultraviolet and infrared spectrum should be of even better quality.

The main part. Preparations examined under a microscope do not emit light, so it should be illuminated. There are different ways to light a subject. Image contrasts (clarity) increase depending on its illumination

Depending on the field of use; fluorescent, ultraviolet, polarizing, interference microscopes.

Depending on the object of inspection; biological, electron, metallographic microscope and others. A luminescent microscope differs from other microscopes in that it has two light filters (placed in front of the condenser and after the objective). In addition to these, there are also special microscopes, there are microscopes that capture fast and slow processes on film, surgical microscopes, and microscopes that check the quality of food. Microscopes are widely used in photography, medicine, biology, physics and chemistry.

Lens. One of the 4 main parts of a microscope that magnifies an object is the objective. There are usually 2-4 lenses. The objective magnifies and inverts objects into the eyepiece.

Eyepiece. The eyepiece magnifies the image of the object captured by the lens. The eyepiece consists of two: collecting and viewing lenses. If the eyepiece is small, the eyepiece will make the object appear larger. By adjusting the 3 eyepieces and 3 objectives of the microscope, objects can be magnified as follows:

Table 1

Eyepiece	Lens	Magnification
3	7	21
8	10	80
8x	15x	120
15x	40x	600

Bathroom table. The table top is usually round or square with a hole in the middle. Light falls on the drug through this hole: a diaphragm is installed on the back surface of the table, which makes the hole bigger and smaller. A mirror located under the product table directs the light to the aperture. One side of this mirror is flat and the other side is concave. If weak light should fall on the drug, the flat side of the mirror should be used, and if strong light should fall, the concave side should be used.

Microscrew. By turning the micrometer screw of the microscope, the viewing tube can be raised or lowered, and the focal distance between the objective and the eyepiece can be adjusted. So, the viewing focal length can be adjusted using a micrometric screw.

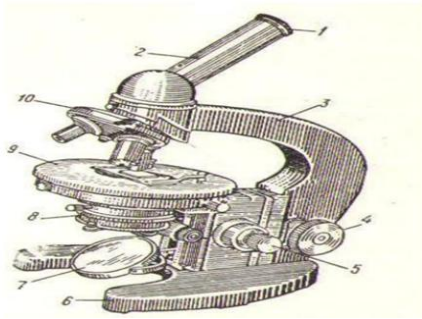

Figure 1. Optical metallographic microscopes

Structure of the microscope (MBI):

1-eyepiece, 2-tube, 3-tripod level, 4-macroscrew, 5-microscrew, 6-foot, 7-mirror, 8-condenser, diagram, 9-object table, 10-revolver

Rules for working with a microscope

A microscope is a very delicate optical instrument. It is not recommended to start work without knowing its structure and location of parts and functions. Accordingly, in order to start working with a microscope, it is necessary to thoroughly master its structure.

When carrying the microscope to the workplace, it is lifted with the right hand by the handle of the tripod and placed under the leg of the left hand. In this way, it is moved from one place to another (desktop). If the microscope has not been used for a long time, all its parts are cleaned with a soft gauze (napkin). If coarse gas is used for cleaning, scratched lines will appear on the surface of the lens in its optical and illuminating parts (in the condenser). This makes the microscope unusable in a short time. A student who starts working with a microscope must follow the following rules:

1. Place the microscope on the work table with the tripod facing you, clean it of dust and dirt, and install it close to the left shoulder, because the operator must always look at the eyepiece with the left eye.

2. The mirror is installed in a special place under the object table, the condenser is raised close to the object table, the diaphragm hole is enlarged, and the 8-number objective is placed perpendicularly (vertically) on the object table by turning the revolver 10. A gentle 'click' (click) should be heard to make sure the lens is in place.

3. Looking at the microscope from the side, turn the macrometric screw and lower the objective object to the table until there is a distance of about 0.7-0.8 cm.

4. Looking at the eyepiece with the left eye (it is necessary to get used to the fact that the right eye remains open as well), moving the concave side of the mirror towards the light source, a milky white field

of view is formed in the microscope.

5. After creating a light field in the microscope, a micropreparation with a visible object (object) is placed on the object table. When placing the drug on the object table, it is necessary to try that the object to be studied is in the center of the hole in the middle of the table, otherwise it may be left out of the field of view. The product is clamped with clamps.

6. Look at the eyepiece of the microscope and carefully move the tube down or up using the macrometric screw to find the exact view of the object (focal distance). If the shape, structure and internal parts of the observed object are clearly visible, it is necessary to draw a picture of it. For this purpose, the shape, external and internal structure of the seen animal is drawn in the notebook (as well as a drawing notebook) kept for practical training. Looking at the eyepiece with the left eye, if necessary, partially turn the macrometric screw with the left hand, and write and draw with the right hand.

If you need to see the item in a large (40 digital) lens, you must meet the following requirements.

Research part.

Methods of finding the amount of grains in the structure of metals and the size of the grains on a scale. Metallographic analysis. Metallographic analysis obtained grain size, phase structure, solidification structure, etc. For example, Figure 1 shows how the solid pitch determines the grain size of copper, but Figure 2 defines a pair of aluminum and titanium bonded by diffusion welding. (Figure 2).

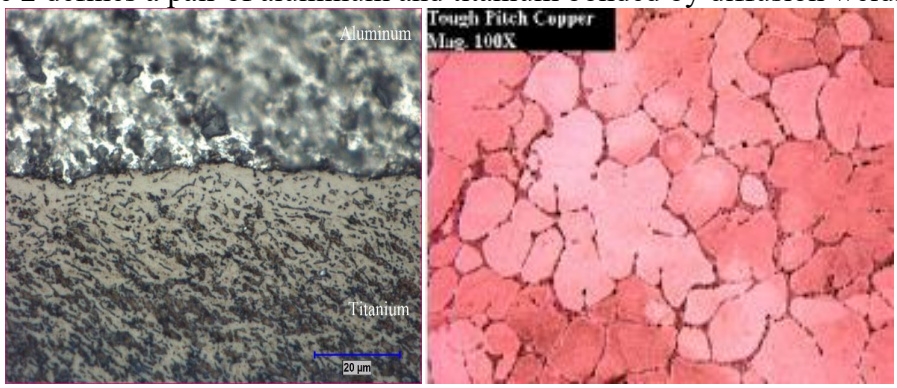

Figure 2. Metallographic analysis

Standards used for details.

Nowadays, the stages of development of machine building and agriculture are systematically increasing the quality of products year by year. Acceleration of work, economic saving and efficient use of products, fuel products, fuel energy and various other materials in a rational way, reducing and preventing waste of products, increasing the operational resources of machine parts and mechanisms are economic. and socially significant.

In our country, increasing labor and work productivity, saving it economically in the general society, its usefulness for the national economy is determined by the criteria of increasing the quality of products.

Methods of control of the product or details are as follows: checking the external structure; external quality control; checking the proportions according to the drawing; verification of authorizations; check the condition of the casting or preparation in which method; checking chemical composition and mechanical properties; including technical recommendation and technical requirement checking and various other methods.

In a broader sense, product quality is defined as the extent to which they meet the buyer's requirements and meet strict requirements.

According to the designation of the products, the products manufactured in one or different enterprises, let's say at different times, their quality is different in all respects. The quality of the product is determined by the organizational control of the quality of the product according to the technical recommendation and technical requirement of the technical requirement. The quality of the product is created according to the stages of production and is brought to the optimal quality level.

Product quality control.

The necessity of quality control in order to collect information about the managed object is indicated in GOST 15467-79: "Product quality control - regular control of the product as a product in the field of

preparation for production, production, operation or consumption is to establish, ensure and maintain the required level of quality through purposeful management of factors affecting quality".

In large enterprises, the quality control system includes units that monitor product reliability, test product samples, and mock-ups. An integral part of quality control work is control of purchased items, all technological transitions in production, access control at sites, operative control, and final control of the finished product. The control functions include the metrological maintenance of production, which ensures the correct use of measuring devices, electronic and computer devices, and monitors their condition. Finally, the preparation of programs and the training and development of personnel, their motivation and encouragement are necessary for the successful resolution of quality issues. Not every enterprise has the full capabilities of quality management. Small enterprises, as a rule, use the services of special consultants, engineering firms, and are limited to being quality engineers.

Mathematical and statistical methods are the basis of modern technical control. Product quality control can be ensured in two ways: by dividing the product into usable and unusable products and by increasing technological precision. Standard categories and types.

Depending on the movement of the sphere of standards, they are divided into the following categories:

1. GOST (state standard).
2. OST (network standard).
3. RST (Union republics, republican standard).
4. STP (standard of mergers and enterprises).
5. (and other new standards).

All production plants and enterprises in any major sectors of the national economy are obliged to adopt state standards (GOSTs). For example, all the various and branded details that are mass-produced in large machine-building, automobile-making, agricultural and other factories must undergo a strict inspection in accordance with GOST. In factories and enterprises, there are details of various sizes and dimensions, which are strictly controlled by the employees of the OTK-technical control department - scales, rulers, calipers, monometers, depth measuring devices and other measuring instruments.

Types of standards, as you know, are divided into the following types depending on the definition of standards:

1. Standards of technical conditions.
2. General technical requirements standards.
3. Standard of parameters or parameters.
4. Basic parameters and standards of various sizes.
5. Standard of structures and dimensions.
6. Standard of stamps.
7. Standard of assortments.
8. Admission rules standards.
9. Standards of control methods.
10. Standard rules for storage and transportation, packaging, marking.
11. Standards of adjustment and operation.
12. Standard of technological process types.
13. And includes other standards.

In addition to these standards, standards corresponding to products, materials, semi-finished products and finished products are also produced.

THYT .-Unified system of technical documents

TTYT-.Unified system of technological training

ICHTT - technological preparation of production -

LHYTL is a unified system of design documentation

THYTT is a unified system of technological documents

International standards in the ISO 9000 series of quality management systems.

A number of countries have had national standards for quality management since the 1970s. First of all, they were developed and used to ensure quality at the design and production stages in such important industries as aviation, cosmonautics, and military equipment production.

The completed standards in the ISO 9000 series were published in July 1994.

It is known that a lot of effective work has been carried out in the field of mechanical engineering and metallurgy in recent years. Including, the works in the direction of material science are also developing.

This microscope consists of 4 main parts:

1. Light part installed in the direction;
2. Diaphragm aperture unit and accessory case with camera;
3. The upper part of the device with an illuminator, a visual tube and a rough mechanism for the object table and a micrometer for the lens;
4. Subject main table

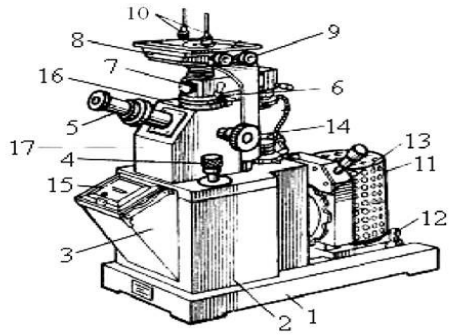

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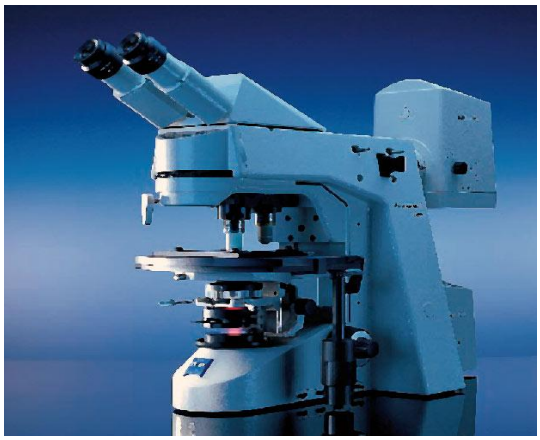
Figure 3. Overview of MIM-7 metallographic microscope.

1-the base of the microscope; 2nd corps; 3rd camera; 4-micrometer screw; 5-ocular and visual tube; 6-porthole holder; 7th porthole; 8th subject table; 9-table rotating holder; terminal 10; 11th light part; 12-light system stopper; 13-color filter holder; 14-micrometer screw; 15-frame with fabric mirror; 16th analyzing part; 17th central section housing.



Picture-7. Scanning optical microscope

Figure-8. IMTS 150x50B (BMI-1TS) brand instrument microscope is used for measuring chisels, mills, grinders and other tools.

Picture-9. New generation digital microscope

Objectives and eyepieces for metallographic microscopes. Basic methods of microscopic research. Types of microscopes.

The human eye can distinguish the distance between particles 250 mm away with an accuracy of 0.08 mm (this number is 0.20 mm for most people). But micro-objects (bacteria, tiny crystals, etc.) are even smaller. The microscope uses not a multi-lens objective, but an immersion objective in which a special clear liquid is poured between the two lenses. In an immersion lens, light scattering is reduced.

Conclusion

In short, depending on the field of use, fluorescent, ultraviolet, polarizing, interference microscopes; depending on the object of examination, there are biological, electronic, metallographic microscopes and others. Lumi-nessent microscopes differ from other microscopes by the presence of two light filters (placed in front of the condenser and after the objective). In addition to these, there are also special microscopes, for example, a microscope that captures fast and slow processes on film, a surgical microscope, a microscope that checks the quality of food. etc. Microscopes are widely used in the fields of photography, medicine, biology, physics and chemistry [10]

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