

STUDY OF SURFACE FINISHING USING A MACRO-SAMPLE

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Abstract: In this article, the study of surface refinement with the help of a macro sample is covered in detail. Determining the external appearance of details or objects, drilling the breaking surfaces of details or objects, checking the structure of die-cast or surface-finished and other metal objects using macro grinding. Microstructure, metal structure, microspecimen preparation technology, used equipment and abrasive materials, reagents used for microanalysis, and optical equipment used.

Basic word: Fracture types, surface finish, Micro structure, metal structure, optical equipment, metal sample, reagents, macro grind, micro grind, roughness, oxides, sulfates, graphite, slag.

Enter: When we look at metals for macro analysis, in the study of surface finish, the surface layer of the metal should be smooth and free of roughness. There should be no cracks, lessons. The macrostructure is studied directly with the eye or by looking through a magnifying glass. This method is used in cases where accuracy is not required. Optical and electron microscopes are used to study the microstructure. This method makes it possible to accurately study the structure of metals and alloys. In general, metallography serves to determine the relationship between the structure and properties of metals and metal alloys. Metallography methods are very useful in metallurgy, metallophysics, etc. Macroscopic analysis is the examination of the material structure (macrostructure), fracture surfaces and other defects of the finished product at a magnification of up to X30 with the help of an eye or a magnifying glass. In this case, the surface of the finished product, quality and processing conditions, its solidification (structure) after the casting process, control of the quality of work, the final form and properties of the details, these include pressure treatment, welding and cutting, and other types[1].

The main part

There are the following ways to determine the quality of details.

1. Determining the appearance of details or objects.
2. Drilling the fracture surfaces of parts or objects
3. Checking the structure of cast pressure-treated or surface-polished and other metal products using macro grinding.

Macro analysis does not provide an opportunity to determine the structure of details in comparison to microscopic analysis. Therefore, macroanalysis is not considered the last, but rather a type of preliminary research. According to macroanalysis, it is possible to choose the part that is studying the detail, that is, to determine whether there are gaps in welded joints, sharp corners and other defects in the finished products. external structure can be determined by heating using macroanalysis. As a result of the macroscopic analysis, it is possible to photograph (or photograph) the studied part of the marking details in the necessary cases. The macrostructure can be known not only by studying the external appearance of the detail, but also through the fracture surfaces of the finished products (casting, forging), and by treating the surface of the details prepared for preliminary study with sandpaper or special reagents (trawling). . We call a sample that has been ground and treated with a special reagent a macro-ground. With the help of macroscopic methods, the types of fracture are determined: viscous, brittle, and fatigue methods[2].

The quality of metals and the reliability of products made from them are characterized by their types of fracture, and depending on the conditions of loading, one-time static tension, (rotational) fracture or impact or multiple fatigue is recommended, as well as temperature and other external factors.

Research part.

Microstructure analysis methods. Structure of metals - view of the internal structure of metals; it is determined with the naked eye or with a magnifying glass and microscope, using X-rays. The structure of metals that can be seen with the naked eye or through a magnifying glass is called macrostructure, what is visible under a microscope is called microstructure, and what is determined using X-rays is called x-ray structure.

Nowadays, it is convenient to analyze micro-samples in electron microscopes. Electron microscopes are connected to computers and can analyze the sample's chemical composition, atomic molecular mass, crystal lattice shape, melting point, boiling point, alloys, who discovered the sample, specific gravity, density, and allotropic changes. information is provided.

Technology of preparation of microsamples, used equipment and abrasive materials.

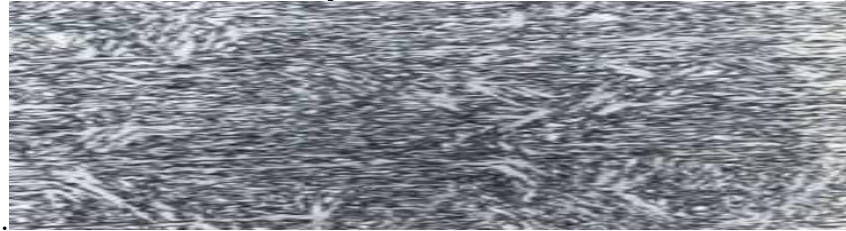
To determine the microstructure, a metal sample is cut and polished on one side like a mirror; it is exposed to a reactive solution. In this case, a microrelief (microcut) is formed on the surface of the sample. If the microslice is observed under a microscope, the microstructure is clearly visible. Studying the microstructure is one of the main methods of assessing the quality of metals. Equipment and abrasive materials used in the technology of microsample preparation: metal cutting machine, iron saw, abrasive wheel, metallographic sandpaper, chromium oxide water, various reagents, sample polishing and polishing equipment, metallographic microscope for observation of prepared microsamples. The most commonly used abrasive materials are iron and its alloys, steel and cast iron, and non-ferrous metals (Fig. 1).

Technology of preparation of microslides. Microsand is cut on a lathe or a hacksaw. The following dimensions are recommended for the preparation of the sandpaper, (if the sample is cylindrical) 12 mm or 12x12 sample height 10-15 mm. The cut sample is cleaned on the imaging wheel. Do not overheat when cleaning the sample[3]. The flattened sample is smoothed using sanding paper. in which polishing paper grade 12-3 (its grain size is 125-20 μm) to M 40-M4 grade (its grain size is 28-35 μm (Gost 6456-75) is cleaned until the lines disappear on the surface of the sample. After polishing, the sample is polished to remove the remaining streaks After polishing an unaffected microsand, some dark spots and streaks can be seen on the white plane. are remaining defects (depth, microcracks, traces of processing).

Reagents are applied to the sample to reveal the microstructure of the metal. Before exposure to the reagent, the surface of the sample is washed with alcohol, then it is submitted to the reagent for the time required for the appearance of the microstructure. The reagent has a different effect on grains and boundaries, phases and structural constituents on the surface of the sample, which differs in structure and chemical composition. As a result, when light falls on the structure, it is reflected differently[4].

Heavily exposed elements appear black under the microscope, while less exposed elements appear white. In single-phase metals, the grains have different crystallographic orientations, so the surface of the microgrind consists of crystallographic planes that are inclined to each other, which are affected in different ways. In multi-phase alloys, the degree of exposure is different. In particular, grain boundaries with a greater variety of impurities compared to metal grains are intensively affected.

A 4-5 percent solution of nitric acid in ethyl alcohol is often used for reactive exposure of



iron-carbon alloys (Fig. 1).

Figure

1.

Martensitic

microstructure

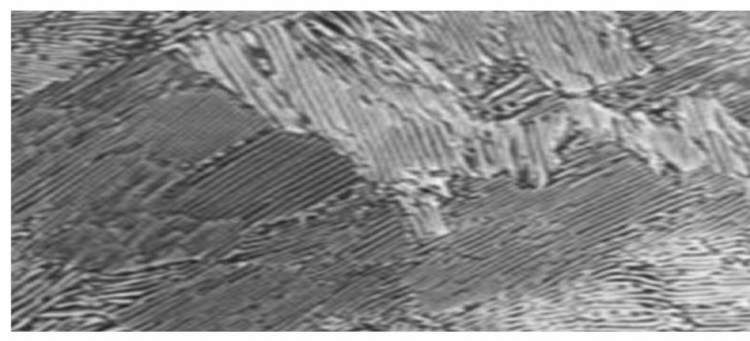
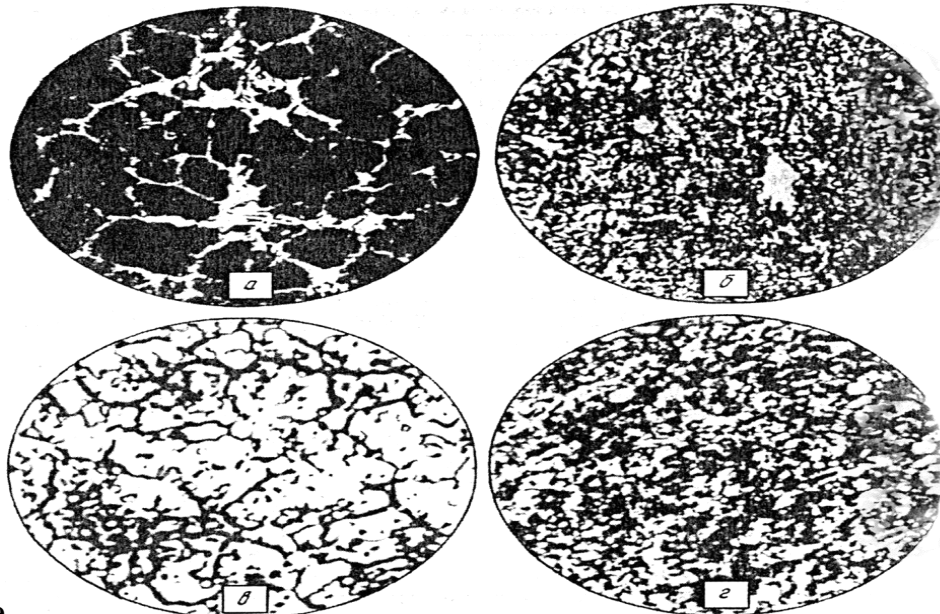


Figure 2. Microstructure of



pearlite

Figure 3. Microstructure view of R5M5 high-speed steel. a) in liquid form; b) state after tying and softening; c) after acquisition; g) condition after discharge;

Reagents used for microanalysis and optical equipment used.

Microslide is exposed to a 4-5 percent solution of nitric acid in ethyl alcohol. Exposure time is 1-6 seconds. After exposure to the reagent, the slides are washed in water and dried with filter paper. Reagents are applied to the sample to reveal the microstructure of metals. Before reacting with the reagent, the surface of the glass is washed with alcohol, then it is submitted to the reagent when it is enough for the appearance of the microstructure. The reagent has a different effect on grains and

boundaries, phases and structural constituents on the surface of the sample, which differs in structure and chemical composition. As a result, when light falls on the structure, it is reflected differently. Heavily exposed elements appear black under the microscope, while less exposed elements appear white. In single-phase metals, the grains have different crystallographic orientations, so the surface of the microgrind consists of crystallographic planes that are inclined to each other, which are affected in different ways. In multi-phase alloys, the degree of exposure is different. In particular, grain boundaries with a greater variety of impurities compared to metal grains are intensively affected[5].

Eyeieces and objects used to select the magnification for microanalysis

The magnification power of the metallographic microscope should be appropriately distributed between the objective eyeieces. For example: To obtain a magnification of x600, use an objective with A=0.85 and an eyepiece with magnification x20, or an objective with A=0.95 and an eyepiece with magnification x10 to achieve the goal possible The magnification characteristics of the eyepiece and objective set of the MIM-7 metallographic microscope are presented in Table 1.

Objective and ocular magnification of microelement MIM-7.

Table 1

№ t/r	Objectives	Glasses						
		Visually speaking				Taking pictures		
		7*	10*	15*	20*	7*	10*	15*
1.	F=23,17; A=0,17	60	90	130	170	70	120	160
2.	F=13,89; A=0,30	100	140	200	300	115	200	270
3.	F=8,16; A=0,37	170	240	360	500	200	340	450
4.	F=6,16; A=0,65	-	320	500	650	-	440	600
5.	F=2,27; A=1,25	500	720	1080	1440	575	1000	1350

Note: * asterisk indicates zoom reduction: F-focus distance; A-aperture

The MIM-8 horizontal microscope can visually magnify the internal structure of metals and alloys, hard alloys and other similar materials up to 1350 times, and up to 2000 times when taking pictures of the structure. The exterior of the MIM-8 horizontal metallographic microscope is shown in the figure below (Fig. 4).

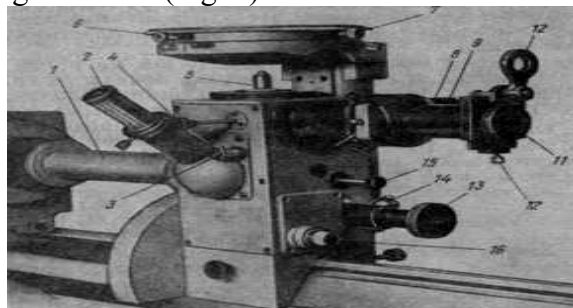


Figure 4. MIM-8 microscope (center part):

1st phototube; 2nd eyepiece; 3-analyzer holder; 4- lighting prism holder; 5th lens; 6- table change screw; 7th microscope table; Drive frame with 8-ring diaphragm; 9-light tube; 10-polarizer; 11-aperture diaphragm; 12-aperture diaphragm adjustment screw; 13-mechanism transfer holder; 14-

clamping screw holder; 15. Holder for transferring the viewing prism for taking pictures; 16-micrometer transmission mechanism drum.

The main part of the microscope is installed on the optical system of the 1.8-4 m long stand. To keep the microscope from vibrating, the stand is mounted on 4 strong dampers. The dampers are fixed to the table, and the drawers on the front side of the table are designed to store the main complete sets of the microscope. The light system is much better than the light system of the MIM-7 microscope. The central part of the microscope includes: optics system; mechanism of large macrometric and small micrometric transmissions; sample table.

The optical scheme of the MIM-8 metallographic microscope is shown in Fig. 7. The photo camera of the microscope is a separate unit and is installed in the optical system and is designed to take pictures in the format of 13x18 cm (Fig. 3.20). The magnification characteristics included in the lens and eyepiece set of the MIM-8 horizontal metallographic microscope are listed in

Table 2.

№ t/r	Objectives	Compensation eyepieces				
		5*	7*	10*	15*	20*
1.	F=15,7:A=0,30	-	-	150	225	300
2.	F=8,4:A=0,65	-	-	300	450	600
3.	F=4,3:A=0,95	-	420	600	900	-
4.	F=2,8:A=1,30	-	630	900	1350	-
5.	F=2,8:A=1,0	450	630	900	1350	-

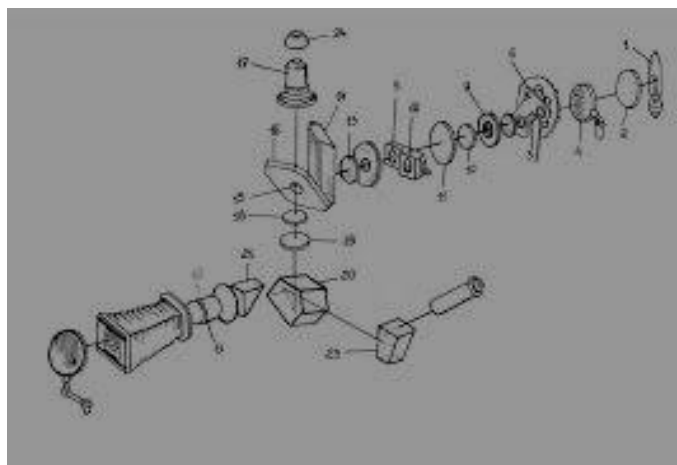


Figure 5. Optical system of the MIM-8 metallographic microscope, beam direction scheme:

1-light source; 2nd collector; 3-heat sink; 4-transmitting lens; 5th diaphragm nation; 6-color filter; 7-polarizer; 8-ocular or gomal; 9th aperture diaphragm; 10,11-tube lighting lenses; 12th diaphragm area; 13-tube illuminating lens; 14th prism; 15-reflective plate; 16-ring window; 17th lens; 18th analyzing nation; Achromatic lens of the 19th visual tube; Prism of the 20th visual tube; Photo 21 is a prism of the tube; Fig. 22 is an achromatic lens of a tube; 23rd visual tube non-displaceable

prism; 24-black field capacitor. The study of the internal microstructure of metals at high magnification (up to 100,000 times) is carried out using electron microscopes.

Conclusion:In conclusion, the study of surface refinement using a macro sample has been widely covered. Determining the external appearance of details or objects, drilling the breaking surfaces of details or objects, checking the structure of die-cast or surface-finished and other metal objects using macro grinding. Microstructure, metal structure, technology of microsample preparation, used equipment and abrasive materials, reagents used for microanalysis, and surface finishes with the help of optical equipment were studied.

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