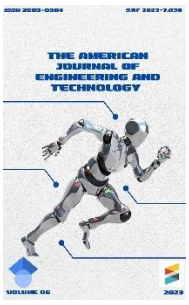
The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME05 ISSUE12 Pages: 33-37
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals



Journal Website:https://theamericanjournals.com/index.php/tajet

Research Article

BASIC METHODS OF STUDYING THE INTERNAL STRUCTURE OF METALS

Submission Date: December 10, 2023, **Accepted Date:** December 15, 2023,
Published Date: December 20, 2023
Crossrefdoi:https://doi.org/10.37547/tajet/Volume05Issue12-08

Atakhonova Sayyora Koraboyevna
Associate Professor Of Andijan Machine Building Institute, Uzbekistan

ABSTRACT

This article presents the methods of analysis of metals. Technological processes, such as checking the macro and microstructure of metals and alloys, are widely covered. Equipment used for macro and micro analysis and slide preparation technologies are widely covered.

KEYWORDS

Cracks, voids, optical microscopy, abrasive, oxides, sulfates, graphite, slag, phase, aerospace, shipbuilding, mechanical engineering, plasticity, shear, welding, malleability, ductility, fluidity.

INTRODUCTION

It is very necessary to increase the quality control and analysis of materials in the development of new materials in all aspects of production in the ever-growing machine-building industry of our independent Uzbekistan.

In the production of high-quality products, the process of creating new materials for modern techniques means that new ideas appear in this technique. The main ones include semiconductor and dark crystals in electronics, composite materials in aviation and rocketry, superconducting and amorphous alloys in radio engineering and electronics, and metal and non-metal alloys in mechanical engineering. In a broader sense, product quality means the extent to which they meet the buyer's requirements and correspond to the established strict requirements. 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 determined by various types of production control and is brought to the optimal quality level. A superficial analysis of objects or details shows that they should be used, not just created as a result of control. From the point of view of metallurgy and metallurgy, the quality

The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME05 ISSUE12 Pages: 33-37
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals

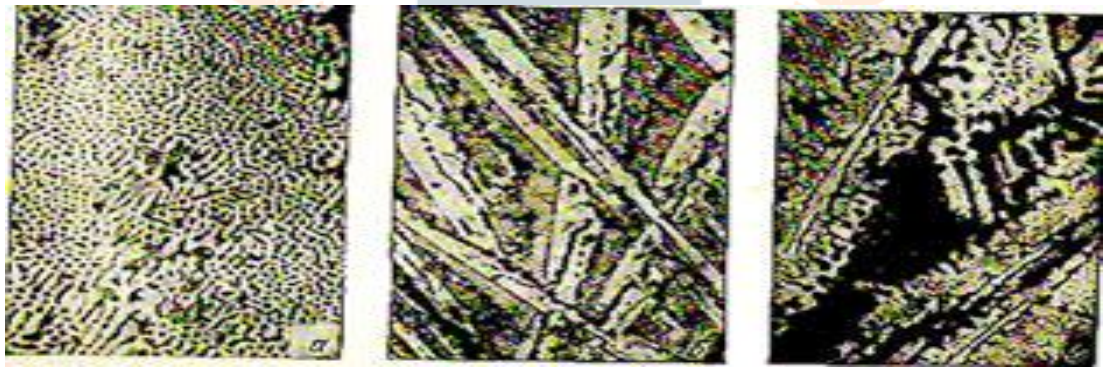
of the parts used in mechanical engineering is mainly understood as the total quality of the parts being prepared, that is, starting from the initial quality for the material and finishing, until the quality of the final operation, thermal analysis and mechanical processing [2]

magnification (up to 3000 times). With the help of microanalysis, the size and shape of crystals and components of alloys are determined, structural features of the structure, the presence of microdefects (cracks, voids, etc.) or non-metallic inclusions, etc. [1].

The heating and cooling curves of metals and alloys make it possible to determine the transformation temperature and to choose a rational temperature range for processing metals or alloys. Processes that examine the structure of materials under magnification with a microscope are considered microscopic or microstructural analysis. The structure observed in this case is called microstructure. Depending on the magnification, the following are used to clearly observe and study all the phases in the material, their quantity, shape and distribution, i.e., their structure as a whole, in a microscope:

White light and a simple optical system, which is a combination of a glass lens and a prism (optical microscopy);

Electron beam or specific currents required to create optical systems used for electromagnetic and electrostatic lenses (electron microscopy). The following are used for the preparation of microsamples of known metals and alloys [3]. Cuts on lathe or metal scraping saws and round bakelite circles. The following dimensions are recommended for microsample preparation. Round samples can be 12x15 mm, cylindrical samples can be 12x12 or 12x15, 15x20 mm. The thickness (height) of the samples is 12x15 mm. Samples cut on the machine are cleaned on abrasive wheels. Do not overheat the samples during cleaning. Cleaned and leveled samples are polished on abrasive polishing papers. The grain size (125-20 µm) of polishing papers is 12-3, the grain size (28-35 µm) is 40-M4 (GOST6456-75).



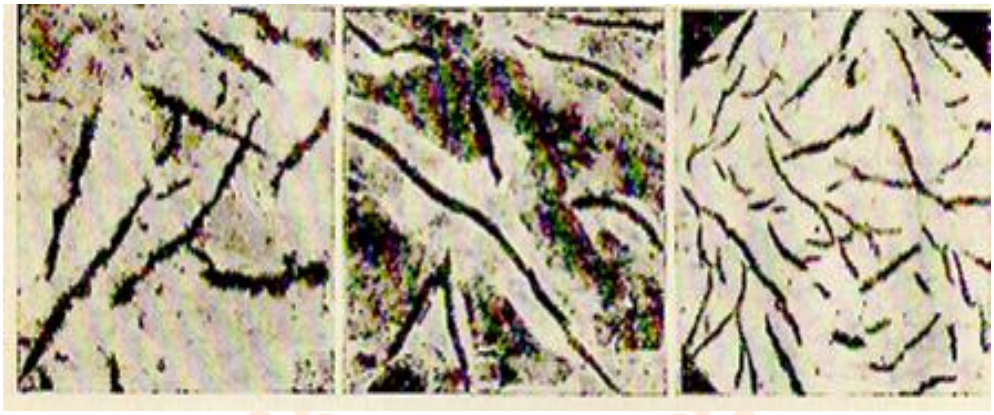
a) b) v)

Figure 1. Microstructure of white cast irons: a - eutectic; b (ledeburite + basic cementite); v - up to eutectic (ledeburite + pearlite + cementite).

White light and a simple optical system, which is a combination of a glass lens and a prism (optical microscopy); Electron beam or specific currents required to create optical systems used for electromagnetic and electrostatic lenses (electron microscopy). The following are used for the preparation of microsamples of known metals and alloys [3]. Cuts on lathe or metal scraping saws and round bakelite circles. The following dimensions are recommended for microsample preparation. Round samples can be 12x15 mm, cylindrical samples can be 12x12 or 12x15, 15x20 mm. The thickness (height) of the

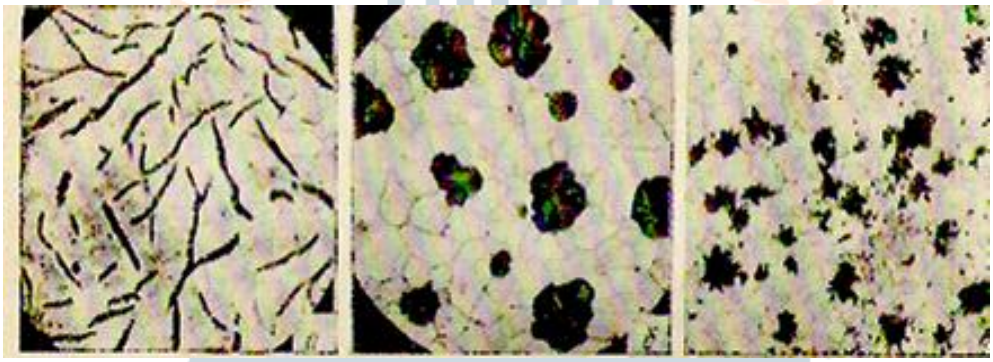
The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME05 ISSUE12 Pages: 33-37
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals

samples is 12x15 mm. Samples cut on the machine are cleaned on abrasive wheels. Do not overheat the samples during cleaning. Cleaned and leveled samples are polished on abrasive polishing papers. The grain size (125-20 mm) of polishing papers is 12-3, the grain size (28-35 mm) is 40-M4 (GOST6456-75).



a) b) v)

Figure 2. Microstructure of gray cast iron: a - pearlitic cast iron; b - ferrite-pearlite cast iron; v - ferritic cast iron



a) b) v)

Figure 3. Appearance of graphite in cast iron; a-vermicular, b-spherical, v-cucumber-shaped

Macro and micro analysis Examination of the macro and microstructure of metals and alloys.

Microscopic analysis refers to the study of the structure of metals and alloys with the naked eye or by magnifying up to 30 times. Microscopic analysis is the study of metal and alloy structures (internal structures) using specially prepared samples (Fig. 1).

The structure of metals examined using macro and micro analysis is called macro and micro structure. Technology of preparation of macro grinding. The technology of preparation of macroslide is as follows; the sample being examined is divided into two using a hacksaw or a lathe. If the macroslide is prepared from the cross-sectional surface of the detail, then it is called a template. The sample is cleaned on the machine, using ego or image wheel, then the sample is

The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME05 ISSUE12 Pages: 33-37
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals

transferred from large numbers to small numbers of metallographic polishing papers. When moving from one number paper to another, the sandpaper turns 90°C. The sandpaper is sanded in one direction until the lines disappear from the surface. Various reagents are applied to the slides for the appearance of the microstructure

Under the influence of various reactive solutions, the appearance of the internal structure is formed on the surface of the macroslides. (dendritic crystals fibrous structures) [4]. Technology of preparation of microslides. Macroslide is cut on a lathe or a hacksaw. The following dimensions are recommended for the preparation of the grinding wheel, (if the sample is cylindrical) 12 mm or 12x12. The height of the sample is 10-15 mm. The cut sample is cleaned on the imaging wheel. Do not overheat when cleaning the sample. 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 grinding on the smallest grain paper, the sample is washed and polished to remove the remaining lines on its surface [5].

After grinding, the surface of the sample is polished, as a result of which the remaining abrasive particles after grinding are eliminated.

The sample can be polished by hand or on a polishing machine. Polishing material is drawn on a rotating disk or on a smooth surface - felt, cloth, cloth, etc. Then it is moistened with water with a special mixture (aluminum, chromium, magnesium oxide). Polishing is completed after the grinding surface is ready.

During polishing, the disc is sprayed with a mixture of chromium oxide in water. aluminum oxide is applied in the form of fine-grained powder. After polishing the microslide that has not been exposed to the reagent solution, some dark spots, gray dots and lines are visible on the white plane. These spots and lines are various non-metallic inclusions (oxides, sulfates, graphite, slag) and imperfections that did not disappear during polishing (roughness, microcracks, traces of processing). Reagents are applied to the sample to reveal the microstructure of metals [6]. Before exposure to the reagent, the surface of the glass is washed with alcohol, then it is submitted to the reagent for the time required for the appearance of the microstructure. The reagent has different effects on grains and boundaries, phases and structural constituents on the surface of the sample, which differ in structure and chemical composition

Automatic grinding and polishing machine. As a result, when light falls on the structure, it is reflected differently.

CONCLUSION

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. The degree of exposure to multiphase alloys is different [7]. In particular, grain boundaries with a greater variety of impurities compared to metall 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.

REFERENCES

1. A.E. Odilkhojayev Construction materials Tashkent-2020
2. Rahimov "Ceramics and refractory materials". R. A. Rakhimov Tashkent-2008
3. William D. Callister, Jr., David G. Rethwisch. Materials Science and Engineering / Wiley and Sons. Great Britain, 2014. - 896 r.
4. E.M. Fedoseeva Materialovedenie. Technology construction materials Internet sites
5. Ataxonova, S. Q. (2021). METALLARNI SIFAT NAZORATINI TEKSHIRISH USULLARINI TAHLIL QILISH JARAYONLARINI TAKOMILLASHTIRISH. Oriental renaissance:

The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME05 ISSUE12 Pages: 33-37
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals

Innovative, educational, natural and social sciences, 1(10), 124-135.

6. Ataxonova, S. Q. (2021). METALLARNI SIFAT NAZORATINI TEKSHIRISH USULLARINI TAHLIL QILISH JARAYONLARINI TAKOMILLASHTIRISH. Oriental renaissance: Innovative, educational, natural and social sciences, 1(10), 124-135.
7. Kasimov, U. K., & Karimov, R. I. (2022). Efficiency of Processing of Secondary Raw Materials. Texas Journal of Engineering and Technology, 9, 15-19.
8. Umidjon, K., & Maxamadmusayevna, S. H. (2020). EDUCATION SYSTEM NOWADAYS. INTERNATIONAL JOURNAL OF DISCOURSE ON INNOVATION, INTEGRATION AND EDUCATION, 1(4), 76-78.
9. Abdujalol, B., Nodir, T., Fakhriddin, M., Nuriddin, T., Kamola, T., & Nargiza, S. (2022). Development of steel wheel detail casting technology. Asian Journal of Multidimensional Research, 11(8), 82-88.
10. Ergashev, D., & Khudayberdiev, O. (2023). Development of thermocyclic processing modes for carbon steels used on cold forming tools. In E3S Web of Conferences (Vol. 383, p. 04066). EDP Sciences.
11. Jalilov Rakhimjon Ravshanbek o'g'li. "CLADDING TILE PRODUCTION USING MAGNESIUM OXYCHLORIDE CEMENT MORTAR IMPROVED BY DIFFERENT WASTES." Gospodarka i Innowacje. 35 (2023): 276-278.
12. www.gov.uz - the government portal of the Republic of Uzbekistan;
13. www.catback.ru – nauchnie stati and uchebnie material;