www.wordlyknowledge.uz Volume: 2, Issue: 1, 2023

IMPROVING ANALYTICAL PROCESSES FOR METALS QUALITY CONTROL INSPECTION METHODS

Atakhonova Sayyora Karaboyevna

Associate Professor of the "Materials Science and Technology of New Materials" Department of the Andijan Mechanical Engineering Institute atakhonova.sayyora@mail.ru

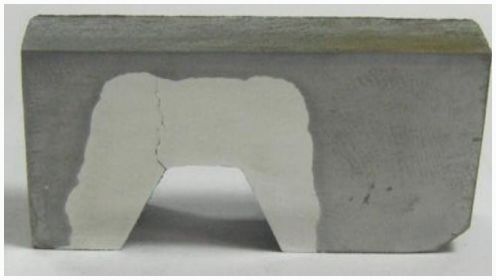
ANNOTATION: This article provides a comprehensive overview of the process of analysis of metal quality control inspection methods. In order to determine the quality control of metals, the necessary information is given on the methods of macroanalysis, micro-Xray spectral analysis, X-ray analysis, acoustic control, radiation control and dilatometric analysis.

Key words: macroanalysis, microray, X-ray analysis, acoustic, radiation, dilatometric, operational demand, hardness, durability, impact resistance.

INTRODUCTION: Today, the structure of metals and alloys is studied by macro and microanalysis, X-ray, as well as defectoscopy (X-ray, magnetic, ultrasound and other methods). Currently, due to the increase in the number of composite substances, such as the development of additional materials (ceramic / metal systems, metal, plastic systems, etc.), the description of "Materialography" is preferred. Fields of metallography, i.e. materialography, are mainly used in engineering work, along with quality control and damage analysis. Studying the macrostructure of alloys with the help of a simple eye and an optical magnifying glass. The macrostructure, that is, the visible structure, is studied with the naked eye or with the help of an optical magnifying glass. Such large defects, i.e., cracks, depressions, gas bubbles, etc., as well as uneven distribution of impurities in the metal, are determined.

DISCUSSION AND RESULTS

Macroanalysis of the sample. With the help of macrostructure, the broken place of metals is studied according to the macroslide. A macroslide is a sample of metal and alloy, one side of which is polished, thoroughly degreased, treated with special reagents and observed under a 5-10x magnifying glass. The technology for preparing macroslides for macroanalysis from metal and its alloys is as follows: the sample under examination is divided into two parts using a hacksaw or a lathe. If the macroslide is prepared from the surface of the cross section of the detail, then it is called a template. The sample is cleaned on the machine using an ego or an abrasive wheel, then the sample is polished on metallographic grinding papers, in which the metallographic grinding papers are polished, then the metallographic grinding papers are moved from large numbers to small numbers. When one number is passed from the paper to another, the sandpaper turns 90 degrees. Grinds are sanded in one direction until the lines disappear from the surface. Various reagents are applied to the slides for the appearance of the macrostructure. Under the influence of various reactive solutions, the appearance of the internal structure is formed on the surface of the macroslides. The macrostructure of metals and alloys is studied under a magnifying glass or MIM-3, MBS-2 microscope.





www.wordlyknowledge.uz Volume: 2, Issue: 1, 2023

Figure 1. Cracking on the surface of the distance ring, macro analysis

The method of microray spectral analysis. X-ray microspectral analysis is used to evaluate the distribution of alloying elements and inclusions in cast or deformed metals, and to estimate the amount of chemical bonds. Also, the analysis of this method is used to estimate the number of parameters of diffusion processes, for example: determination of concentration divisions as a result of chemical thermal analysis of the depth of the diffusion layer. The property of various materials, that is, metals, depends not only on their structure, but also on their chemical composition. To determine the chemical analysis of elements from uranium to boron (except fluorine and oxygen) in various objects in micro volumes (3-10 μm^3), for metals and non-metals, a microanalyzer, for example: MAR-2, is used.

The main principle of operation of this device is that the flow of electrons in it, the defined length of the wave and the creation of electron guns, the interaction of microscales on the surface of the object, and the characteristics of X-rays. The length of the columns in it corresponds to the property of only one element, to one or another content in the local section object. Analytical responses using MAR-2 can be continuously registered on an object area of 200x200 μm^2 (maximum sample size 9x15x8 mm). Micro X-ray spectral analysis is used to evaluate the distribution of deformed or cast metals, alloying elements and primes (additives), as well as to determine the number of chemical compositions. This method is also used to determine the number of parameters of diffusion processes, to determine the concentration of the depth of diffusion layers in chemical thermal analysis.

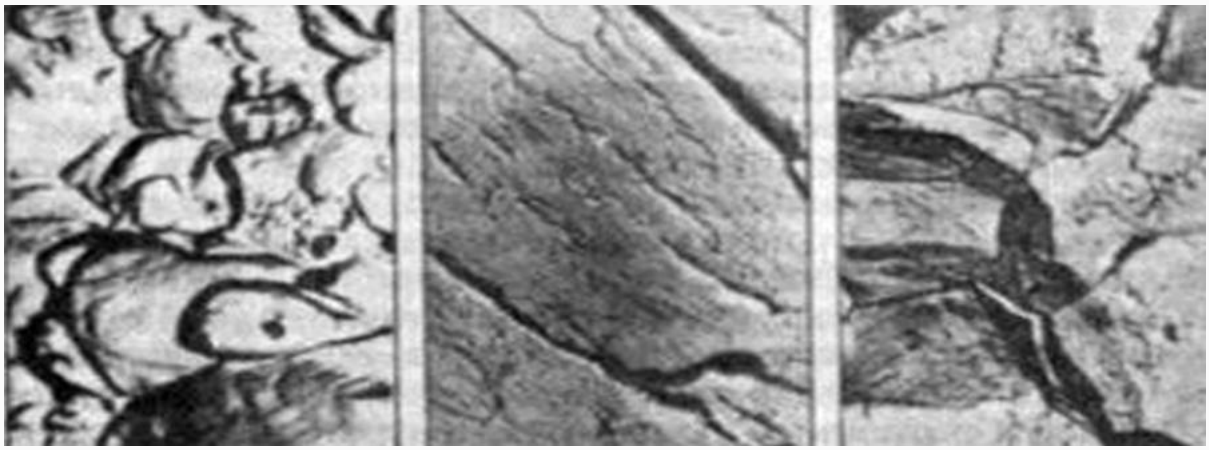


Figure 2. Micro analysis

The location of atoms in the crystal lattice, their defects, dislocations, and the location of fragments can be determined and studied using x-ray methods. The x-ray method of checking the structure of metals is based on X-ray diffraction of a number of atoms in the metal crystal lattice, which allows measuring the spacing of atoms about ÍÅ and, therefore, determining the shape of the crystal lattices of metals or alloys and the spacing of atoms in the lattices. The spatial arrangement of atoms is reflected in an X-ray image. Each metal forms a unique system of lines with a certain location, width and intensity on the radiograph.

X-ray analysis

X-ray structural analysis - crystal lattices of almost all metals and alloys are determined. As you know from the course of physics, X-rays are similar in nature to light rays, but X-rays

www.wordlyknowledge.uz Volume: 2, Issue: 1, 2023

differ from light rays in that their wavelength is much smaller. Since the wavelength of X-rays is small, these rays do not return from the surface of the substance, but penetrate into this substance. In 1913, Professor G.V. Wolf of Moscow University showed that it is possible to interpret this X-ray image as the result of diffraction of rays returning from some mutually parallel planes of atoms. Determining the shape of the metal crystal lattice and the spacing of atoms in the lattice is based on these. The following x-ray devices are mainly used to check the internal structure (structure) of metals. M: URS-55, UVS-70-K-1, drone-2.0, drone-3.0, drone-3M and other new modern accessories. Analysis of the diffraction pattern in the following 13 images makes it possible to determine the presence of defects in the atomic crystal structure.

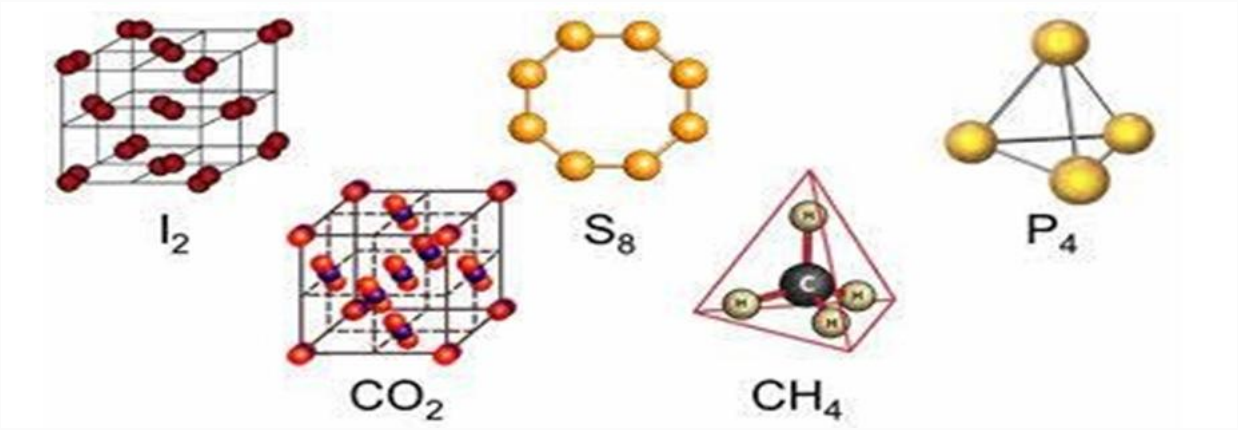
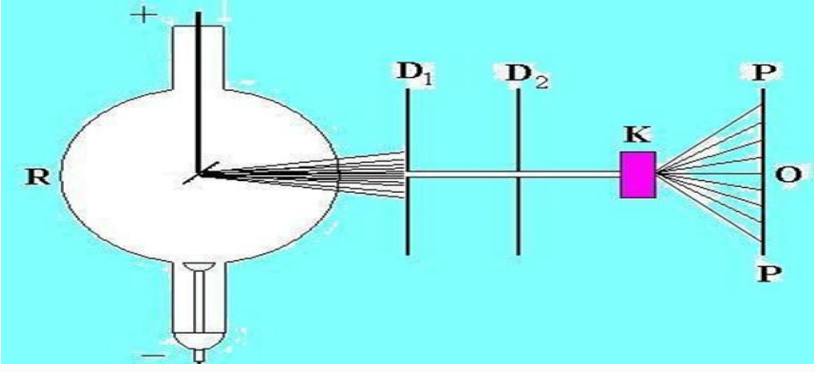


Figure 3. X-ray analysis. Crystal structure of elements of crystalline iodine, sulfur, white phosphorus, carbon dioxide, methane.

According to X-ray analysis, the following special carbide phases are identified: B4C, Me23S6, Me7S6, Me7S7, etc. This method is performed with Fe-iron deposition in step scanner radiation in the DRON-2.0 X-ray machine

Nature and properties of X-rays

X-ray radiation is a high-frequency change in the state of the electric magnetic field that propagates through space at a speed of about 300,000 km / s, that is, electromagnetic waves. On the scale of the electromagnetic spectrum, X-rays range in wavelength from about 10 -8 to 5 · 10 -12 meters, which several orders of magnitude shorter than optical waves. This ranged from 3 10 16 to 6 10 19 Hz to frequencies and energies from 10 keV to 250 keV or 1.6 10 -18 to 4 Suitable for 10-14 J.High-energy electrons of accelerated charged particles interact with electric and magnetic fields and atoms of matter.



www.wordlyknowledge.uz Volume: 2, Issue: 1, 2023

Figure 4. The discovery of X-rays

X-ray photons are characterized by high energy and high penetrating and ionizing powers, especially with wavelengths below 1 nanometer (10 -9 m). Is important for hard X-rays. In the process of photoabsorption and non-coherent (Compton) scattering, X-rays interact with matter and ionize its atoms. In the process of photoabsorption, an X-ray photon is absorbed by an electron of an atom and transfers energy to it. If its value exceeds the binding energy of an electron in an atom, then it will leave the atom. Compton scattering is characteristic of harder (energetic) X-ray photons. Part of the absorbed photon energy is used for ionization; the primary photon is emitted at a certain angle to the direction of the photon, and the secondary one is emitted with a lower frequency. When we determine the quality control of metals in scientific technology and production, we often use macro, micro and X-ray analysis methods. Acoustic, analytical control, dilatometric analysis, x-ray technology, crystal imaging methods, powder method, polar pattern method, scanning electron microscope, micro analyzer, magnetic control instruments and equipment are used in the creation of new materials that meet high-quality global standards and meet operational requirements. , we need to have information about acoustic emission methods and equipment [2]

(Greek: akousticos - I hear) is a branch of physics that studies sound phenomena, i.e. the processes of generation, propagation and reception of mechanical waves in the body, the connection between sound phenomena and other physical phenomena. The laws of propagation and return of sound were established in the time of Euclid. By the 17th century, it was discovered that there was a relationship between the pitch and the number of vibrations. Galileo and the French physicist Mersenne (1588–1648) scientifically explained the propagation of sound waves in air and measured the speed of sound.

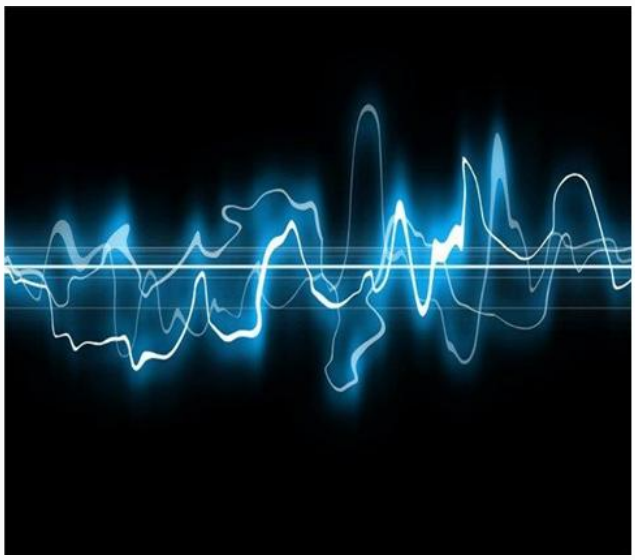


Figure 5. The sound is magnon. waves

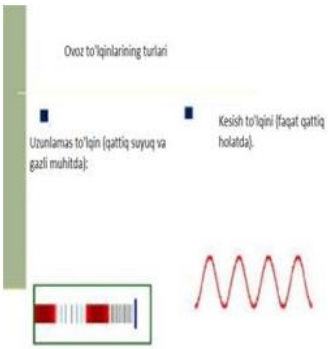


Figure 6. Types of sound

www.wordlyknowledge.uz Volume: 2, Issue: 1, 2023

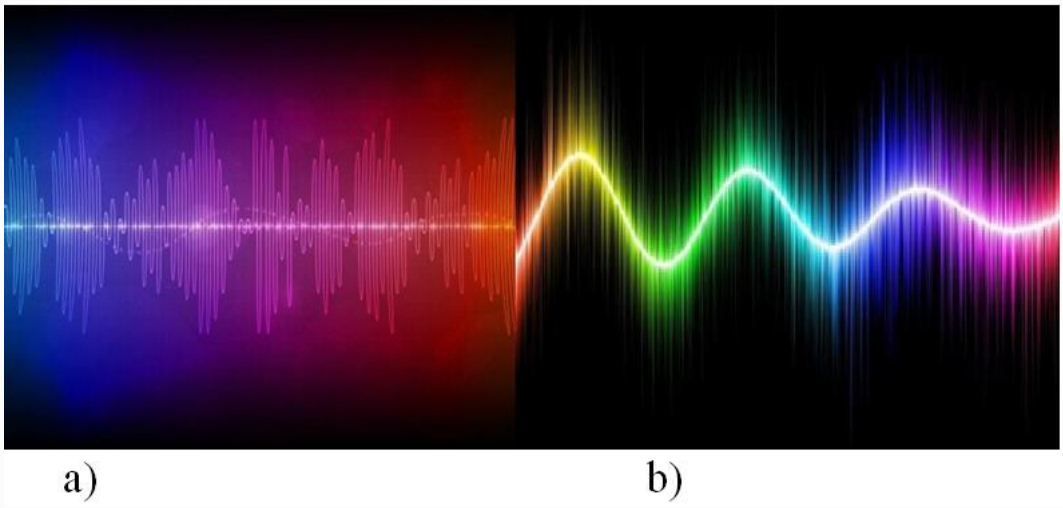


Figure 7. Surface level and elastic forms of acoustic waves (a,b)

General A. studies sound generation and propagation and acoustic measurement methods. Sound is a phenomenon that lasts for a short time, it can be continued for a long time only if it is supplied with energy. For sound to be produced, the vibration must continue (self-oscillation). Vibration amplitude, number, period, vibration shape, sound wave wavelength, waves 282 propagation speed, wave energy.In recent years, tests for degradation or deterioration of materials under the influence of a certain type of environment have increased greatly. Mechanical, thermal, or electrical property tests are often performed on the material before, during, and after exposure to some controlled environment. The property change is then recorded as a function of exposure time. The environment can include heat, moisture, chemicals, radiation, electricity, biological substances, or some combination thereof. Thus, the material's gravity can decrease after exposure to heat, moisture, or salt spray, or increase with radiation or electricity. The strength of organic materials can be reduced by certain classes of fungus and mold. Radiation control. Radiation (lat. radiatio - radiation) - electromagnetic and corpuscular radiations, solar radiation, streams of cosmic rays arising as a result of nuclear changes. The effect of radiation on a living organism is determined by the radiation dose. It is measured by roentgen (r). The amount of radiation depends on the damaging effects of absorbed radiation and other radioactive radiation. Radiation up to 20 r per day is a safe dose for the human body. More than this amount of radiation damages the tissues of the body and makes a person suffer from radiation sickness. Radiation dose is measured using dosimetric devices. With radioactive substances (a, r~, u rays, neutrons, etc.) and other ionizing radiation sources (x-ray devices) a set of measures has been developed to reduce their harmful dose to a safe radiation dose during operation. Radioactive substances are not released into the environment from Berk radiation sources (hermetic radiation sources, X-ray devices, accelerators, etc.). When working with such sources, the body is affected only by external radiation. To reduce the external radiation dose, it is necessary to minimize the time of work in the radiation field, to stand far, far away, and to shield the source or object. When working with open sources of radiation, radioactive substances can enter the body through the respiratory tract, stomach, intestines or skin, and the body can be irradiated from the inside (Radioactivity). In order to reduce the internal radiation dose, it is necessary to seal the technological equipment and the workplace, put a filter in the ventilation systems, use personal protective equipment and follow the rules of radiation hygiene. Radiation safety service (RXX) conducts radiation control in all enterprises working with radioactive substances and other sources of ionizing radiation (Radiation protection).

www.wordlyknowledge.uz Volume: 2, Issue: 1, 2023

Effects of radioactive rays on the human body.

Radioactive substances have certain special properties, and as a result of their impact on the human body, a dangerous situation can arise. The most dangerous part of radioactive substances is that its effects are not felt by the human body's sensory organs. That is, despite the fact that a person works under the influence of radioactive rays for a long time, he may not feel their harmful effects at all. And the result is a sad end. That is why it is necessary to be especially careful when working with radioactive materials. Radioactive radiation of the human body can be internal and external. Since external radiation is caused by a certain external radiation source, the penetrating power of the emitted rays is of great importance. Rays with high penetrating power are more harmful to the body. Internal radiation occurs when light-scattering substances fall into the internal systems of the human body, for example, through the layers of damaged skin into the blood, respiratory organs, lungs and mucous substances, digestive organs. In this case, the radiation lasts as long as the light-dispersing substance is irradiated or stored in the body. That is why radioactive substances are especially dangerous when they have a long decay period and strong radiation.

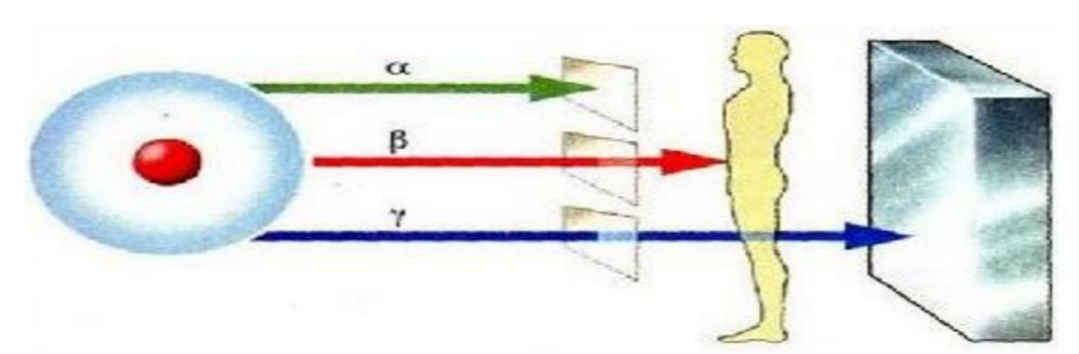


Figure 8. Effects of radioactive rays on the human body

The biological effect of radioactive radiation is described as ionization of atoms and molecules in the body, which in turn leads to changes in the composition of various chemical compounds and disruptions in normal molecular compounds. This, in turn, causes disruption of metabolism in living cells and failure of biochemical processes in the body. If the exposure to high-power radiation continues for a long time, the destruction of some cells is observed, and it ends with the destruction of some organs and even the whole organism. Under the influence of radioactive radiation, there is a violation of the general blood circulation system of the body. In this case, the blood circulation slows down, the blood's coagulation properties are lost, blood vessels, especially capillary blood vessels, become fragile, the functioning of the digestive organs is disturbed, the person loses weight, and the body's ability to fight external infectious diseases decreases. The effect of radioactive substances on the hand is not felt before. Over time, the hand becomes wrinkled, there are cracks, and the nails fall off. When the alpha and beta rays of radioactive rays are exposed from the outside, the skin layer of the body can show sufficient resistance. But when these radioactive rays fall into the digestive organs, their harmful effects increase. Therefore, when the permissible doses (YQD) of internal and external radiation are determined according to the safety norms of radioactive radiation NRB-76, the category of irradiators and dangerous organs are taken into account. The material and thickness of the screen is selected taking into account the distances of the rays. Use of heavy metals in gamma radiation protection need For example, lead, tungsten; and others give good results. Due to their shielding properties, medium weight metals work well as screens (steel, cast iron, copper alloys, etc.).

www.wordlyknowledge.uz Volume: 2, Issue: 1, 2023

With the help of screens, there are options to reduce radiation in workplaces as much as you want.

Dilatometric analysis.

Dilatometry provides one-dimensional data during sintering. In many cases, the sintering change is not uniform throughout the workpiece, so dilatometry results only tell part of the story. Alternatively, in-situ video imaging can be used to extract two-dimensional data from sequential photographs [2] . Optical emission inside the furnace at high temperatures is a dark image. This problem can be compensated for in combination with the closure of the imaging system using high-intensity strobe lighting, which provides a means of creating high-resolution images at high temperatures. The camera and strobe are converted in unison and at a frequency of 1 Hz providing high resolution data. Data from the video sintering profile is shown in Figure 9, where the deformation over time of sintering is clearly visible. From these data, the models provide a means of obtaining an effective system viscosity to model sintered dimensions. As an example of a possible representation, Fig. 4.36 is a photograph taken during liquid phase sintering at 1500 °C (1773 K) and shows the progressive liquid formation, defining the boundary between the solid surface and the liquid. The liquid nucleated at the hot spot and dissipated as the heat generated liquid, a process that propagated at about 1 mm/s

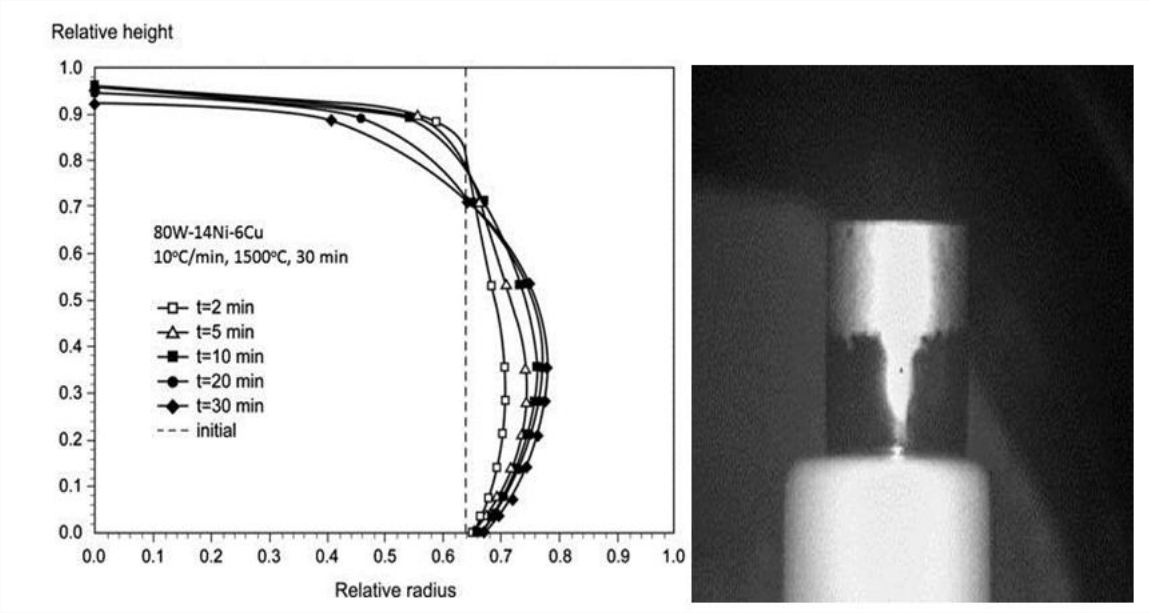


Figure 9. Differential dilotometries

Dilatometry showed that the compacts exhibited low-temperature expansion before damaging high-temperature contraction. Various methods of dilatometry are routinely used in various scientific fields, where the characterization of thermal and mechanical properties is key to material processing. Therefore, thermal analysis is used in industrial laboratories and research activities where various materials such as metals, polymers, ceramics and composites are studied. The number of publications is very large, so only some examples can be given. A comprehensive review of the fundamentals and key applications of thermomechanical analysis and thermodilatometry of polymers is provided by Menkzel et al. The most important measurements for polymers include the determination of thermal expansion, glass transition temperature, and crystallization [5].

www.wordlyknowledge.uz Volume: 2, Issue: 1, 2023

Thermodilatometry is also widely used to monitor ceramic work. It is used in measuring instruments and experimental observations. In addition, in order to ensure high quality control of polymer composite materials from non-metallic materials, PCMs meet the requirements of high quality with properties such as durability, cold resistance, wear resistance, resistance to aggressive environments, low thermal conductivity and water absorption [1].

In the process of conducting scientific research, it is now possible to create cheap and high-quality products using new innovative technologies and processing technologies of secondary polymer materials. [4].

In this place, the quality control of metals is systematically discussed in order to meet the requirements of ISO-999 in determining the quality control of the material. Especially in production, the analysis of initial control, intermediate control and final control should be at a high level. In the initial control of production, our steel sheets should be of high quality, in the intermediate control, cutting of steel sheets, welding, etc. Technological processes such as "support" should be of high quality. In the final control, labeling, packaging and export processes must be of high quality.

CONCLUSION

In conclusion, we can say that when creating a high-quality product, we must systematically improve quality control in order for the product to last for a long time. Depending on where the product will be used, we should choose the material. . Methodology of quality control of state educational standard materials, electron microscopic, spectral, micro-x-ray, spectral, magnetic, acoustic implies mastering the physical foundations of the methods. According to the standard, the engineer should have an understanding of X-ray technology, crystal imaging methods, powder method, polar pattern method, scanning electron microscope micro analyzer, magnetic inspection instruments and equipment, acoustic emission methods and equipment.

REFERENCES

1. Tojiboyev, B. M., Muhiddinov, N. Z., Karimov, R. I., & Jalilov, R. R. O. G. L. (2021). IKKILAMCHI TERMOPLAST POLIMERLAR ASOSIDA QURILISH SANOATI UCHUN POLIMERKERAMIK KOMPOZITSION MATERIALLARNI OLISH JARAYONINI TAKOMILLASHTIRISH. *Oriental renaissance: Innovative, educational, natural and social sciences*, *1*(9), 386-392.
2. Karimov SH.A. “Metallarni tuzilishi va detallarni sifatini nazorati”.Toshkent- 2019 “Sano-standart” nashiryoti, 2019 y.
3. Vikipediya, ochiq ensiklopediya Jump to navigationJump to search
4. НамМТИ илмий-техника журнали www.nammti.uz Scientific and technical journal of NamIET, ISSN 2181-8622, TOM 5 - № 2, 2020. 96-bet.
5. To‘raxonov A. S, Metallshunoslik va termik ishlash, T., 1968.

5.Tojiboyev, B. M., & Atakhanova, S. K. (2020). Radiation Treatment Of Composite Polymer Coatings At Optimal Technological Parameters And Study Of Their Properties. *The American Journal of Engineering and Technology*, *2*(11), 153-158.

6.Ataxonova, S. Q. (2021). METALLARNI SIFAT NAZORATINI TEKSHIRISH USULLARINI TAHLIL QILISH JARAYONLARINI TAKOMILLASHTIRISH. *Oriental*

www.wordlyknowledge.uz Volume: 2, Issue: 1, 2023

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

7.Ataxonova, S. Q., & Murodjon o'g, S. U. B. (2022). Analysis Of Magnetic Materilas. *Texas Journal of Multidisciplinary Studies*, *6*, 23-26.

8.Kakharovich, K. U., & Ataxonova, S. Q. (2022). Analysis of Signature of Stainless Steel in Uzbekistan and Abroad. *International Journal of Human Computing Studies*, *4*(3), 17-21.

9.Ataxonova, S. Q., & Mo'Ydinova, D. R. (2022). METALL QOTISHMALARINING MARKALANISHI TAHLILI. *Oriental renaissance: Innovative, educational, natural and social sciences*, *2*(3), 312-326.

10.Atakhanova, S. K., Kasimov, U. K., Karimov, R. I., & Khasanov, B. M. (2021). Improving the wear resistance of mining excavator.

12.Atakhanova, S. K., Shavkatov, U. M., Abduqohorova, D. V., Vaxobova, M. O., & Mo'ydinova, D. R. (2021). IMPROVING THE ABRASION RESISTANCE OF MINING EXCAVATOR BLADES. *Thematic Journal of Applied Sciences*, *1*(1).