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Application and Research of Microscope in the Identification of Cultural Relics

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Abstracts: As the core link to reveal the value of cultural relics, the microscope technology plays a vital role in the identification of cultural relics. The purpose of this paper is to discuss the application of microscope technology in the field of cultural relics identification, its unique advantages and the current development situation, and put forward corresponding suggestions. Microscope technology is mainly used to observe the microstructure of cultural relics to help identify their authenticity and determine their age. Its significant advantages are its high magnification and resolution, ease of operation, and its use in combination with other analytical techniques, which can significantly improve the accuracy of identification. Looking forward to the future, microscope technology is expected to play a more important role in the field of cultural relics identification, providing solid technical support for the protection and research of cultural relics, and contributing more physical evidence to the inheritance and promotion of traditional Chinese culture.

1. Introduction

The Chinese civilization, with a long history and extensive and profound, constitutes a unique spiritual symbol of the Chinese nation. It is not only the foundation of contemporary Chinese culture, but also the key to maintain the global spiritual bond of Chinese people. At the same time, it is also a valuable source of Chinese cultural innovation. Cultural relics are not only witnesses of history, but also precious cultural heritage bearing rich historical, artistic and scientific values. Through the detailed identification of cultural relics, researchers can understand their age, authenticity, material, technology and other aspects of information, so as to have a deeper understanding of and study the history. These cultural relics not only record the development trajectory of human civilization, but also reflect the social features and cultural characteristics of various times [1]. Through the in-depth study of cultural relics, researchers can better understand the past, thus providing valuable experience and inspiration for the development of modern society[2]. The traditional method of cultural relic identification mainly relies on the experience and intuition of experts. Although this method can provide valuable judgment to a certain extent, it inevitably has subjectivity and sometimes even makes misjudgment. With their rich knowledge and experience, the experts make a comprehensive analysis and judgment by observing the appearance, decoration, style and other characteristics of the cultural relics, combined with historical documents and archaeological discoveries. However, the limitation of this approach is the individual experience of the experts. And the knowledge level may

affect the accuracy of the identification results.

However, with the continuous progress of science and technology, especially the rapid development of microscope technology, the field of cultural relic identification has ushered in a new change. The application of microscope technology makes the relic identification more scientific and accurate. Through the microscope, experts can observe the subtle structure on the surface of the relics and even identify details that are invisible to the naked eye. For example, a microscope can help researchers find tiny scratches, wear marks and the microstructure of pigments on the surface, thus providing a more reliable basis for judging the age and authenticity of artifacts. This technique not only improves the accuracy of the identification, but also provides an important reference for the protection and restoration of cultural relics. The application of microscope technology enables experts to have a more accurate understanding of the material and process of cultural relics, so as to develop a more scientific protection and restoration scheme [3]. The popularization and application of microscope technology make the identification of cultural relics more rigorous and scientific, and inject new vitality into the research and protection of cultural relics. With the continuous development of science and technology, microscope technology is also constantly improving, from the initial optical microscope to the current electron microscope, the resolution is getting higher and higher, the range of observation is also more and more wide. In the future, with the application of more high-tech means, the identification and protection of cultural relics will be more accurate and efficient, becoming a cultural heritage of mankind. The inheritance and development of production to make greater contribution [4].

2. The dissemination of the cultural value of the cultural relics

The cultural value carried by cultural relics is a bridge connecting history, modern and even the future, which is of inestimable importance for cultivating national spirit, inheriting historical and cultural heritage, and enhancing national self-esteem and pride. The following is the key field of the dissemination of cultural values, and education popularization covers two aspects of school education and social education. School education: cultural relics knowledge should be incorporated into the curriculum system, and students should be guided to deeply understand the historical background of cultural relics, artistic characteristics and cultural significance. Social education: to popularize the knowledge of cultural relics to the public by organizing lectures, exhibitions, workshops and other activities. The exhibition exhibition includes two forms of museum exhibition and touring exhibition. Museum exhibition: elaborate planning and exhibition of cultural relics to reveal the artistic and historical value of cultural relics to the public. Tour exhibition: to promote the cultural relics exhibition to all parts of the country and even the international world, to enhance the publics understanding of Chinas rich cultural heritage. Media communication involves the traditional media and the new media two channels. Traditional media: use TV, radio, newspapers, magazines and other traditional media to produce special programs or columns to introduce cultural relics. New media platforms can utilize the Internet, social media, mobile applications, and other new media tools to disseminate information about cultural relics through various forms, including pictures, videos, and interactive games. Academic research includes. Publishing monographs and academic exchanges. Publishing monographs: publish books on cultural relics research, and deeply explore the historical, artistic and scientific value of cultural relics. Academic exchange: Organize academic seminars to promote the exchange and cooperation of cultural relics research at home and abroad.

Cultural and creative products cover two categories of cultural derivatives and digital products. Cultural relics derivatives: develop cultural and creative products with cultural relics as the theme, such as handicrafts, clothing, stationery, etc., to integrate cultural relics into daily life. Digital products: Use AR and VR technology to develop digital cultural relics products and provide

immersive experience. The protection of laws and regulations includes two levels: legislative protection and law enforcement supervision. Legislative protection: Formulate and improve relevant laws and regulations to ensure that cultural relics are not damaged and the value of cultural relics can be passed on. Law enforcement supervision: strengthen law enforcement, crack down on illegal activities such as theft and trafficking of cultural relics. International exchange includes two aspects of cultural relics diplomacy and cooperative research. Cultural relics diplomacy: to promote cultural exchanges with other countries through exhibitions of cultural relics and academic exchanges. Cooperative research: Cooperate with international organizations to jointly study and protect human cultural heritage. Through these ways, the cultural value of cultural relics can be effectively spread, make cultural relics "alive", and become an important force connecting tradition and modernity and promoting the dissemination of socialist core values.

3. Application of microscopy in cultural heritage identification

Microscope technology has revolutionized heritage identification, revealing details that are invisible to the naked eye. It provides experts with key information about the materials, craftsmanship, and age of the artifacts. By observing the microscopic form, experts can determine the material type of the cultural relics, and infer the process by analyzing the production traces. In addition, the microscopic identification of the cultural relics can also reveal the historical date of the cultural relics. Through the observation of weathering, corrosion and wear on the surface of cultural relics, identification experts can infer the age range of cultural relics. In some cases, the microscope can even help to find the small words and patterns on the cultural relics, providing strong evidence for the study of the historical background of the cultural relics. It is worth mentioning that the identification of cultural relics under the microscope not only improves the accuracy of the identification, but also provides an important basis for the protection and restoration of cultural relics [5]. With the help of microscope, identification experts can more accurately understand the disease status of cultural relics and provide scientific basis for the formulation of reasonable restoration plan. The following are some of the typical heritage types and their characteristics under the microscope:

Ceramic relics: when observing the glaze of the ceramic, we should pay attention to the smoothness of its surface, the size and distribution of bubbles, and whether there is flow glaze or cracking phenomenon. For the fetal body of ceramics, the particle size of the particles, the mineral composition, the number and morphology of stomata, and the sufficient degree of sintering should be analyzed. In terms of decorative techniques, details such as engraving, printing and painting should be carefully investigated, as well as the hierarchical structure of glaze color or glaze color.

Metal relics: In terms of metal structure, the shape, size and arrangement of metal crystals and the proportion of allocomposition should be examined. In terms of casting trace, attention needs to be paid to the pores, shrinkage holes, streamlines and other characteristics produced in the casting process. In terms of corrosion characteristics, we should analyze the types, distribution and forms of corrosion products, such as the microstructure of copper rust and iron rust.

Paper and painting and calligraphy cultural relics: In terms of paper fiber, it is necessary to observe the length, thickness, arrangement of the fibers and the types of paper raw materials. In terms of ink trace characteristics, the morphology, distribution and penetration of ink particles, as well as the production process of ink in different periods should be studied. In terms of color layer, it is necessary to analyze the level, mixing situation and chemical composition of pigments.

Textile relics: In terms of fiber characteristics, the fiber diameter, surface texture, fracture and wear conditions need to be analyzed (as shown in Figure 1). In terms of weaving structure, the density, pattern and method of weaving should be observed.

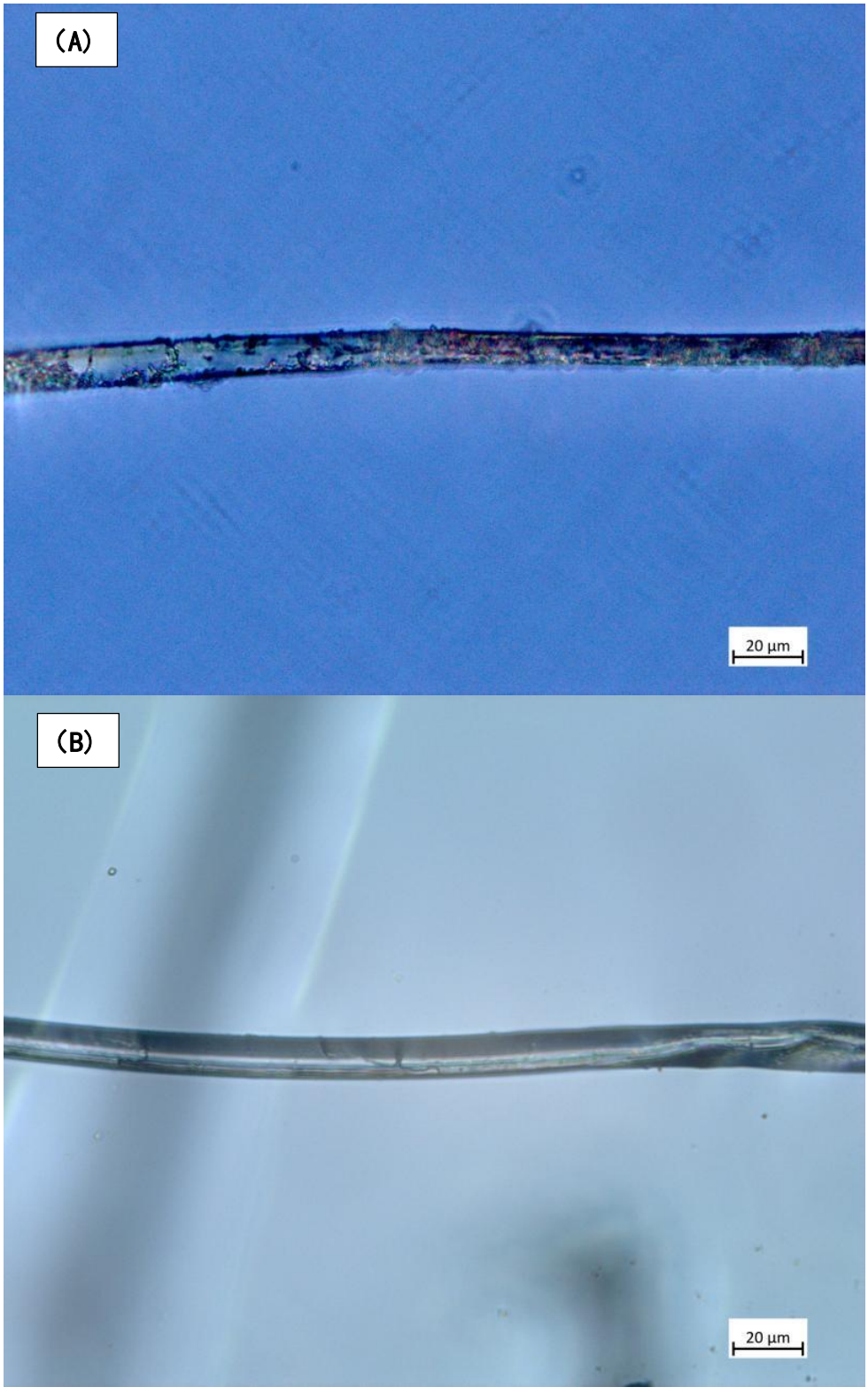

Figure 1 Comparison of cultural relic sample silk (A) and non-cultural relic sample silk (B) ZEISS Axio Scope.A1-500x

Bone cutin relics: In terms of structural characteristics, the microstructure of the bone or angle needs to be examined, such as pores, growth lines, and repair traces. In terms of processing traces, the details of carving and grinding should be carefully observed.

Wooden cultural relics: in the aspect of wood fiber, it is necessary to observe the arrangement of wood fiber, ring structure and cell morphology. In terms of processing marks, the details of carving, mortise and tenon structure, and surface treatment (such as paint, inlay) should be examined.

Jade and jewelry cultural relics: in terms of internal structure, it is necessary to observe the package, cracks, color bands and growth structure (such as the fibrous structure in jade). In terms of processing marks, the marks of cutting, grinding, carving and the degree and direction of polishing.

Glass relics: In terms of bubble characteristics, attention should be paid to the size, shape and distribution of the bubbles to reflect the melting and cooling process. In terms of the surface characteristics, the details of the polishing degree, wear marks and decorative techniques should be observed.

Microscope technology plays a vital role in the field of cultural relic identification. Through detailed observation, it reveals those microscopic details that are invisible to the naked eye, so as to provide strong microscopic evidence support for the authenticity, age and production technology of cultural relics. For example, in the identification of ancient porcelain, the microscope can help to deeply observe the fine texture of the glaze, the structure of the tire body and the layers and components of the painting, combined with the relevant historical background and documents, can more accurately judge the authenticity and approximate age of the porcelain. Similarly, in the study of ancient fabrics, the microscopy technology can reveal the microstructure of the fiber, the composition of the dye and the technical details of the weaving, and through the combination of cultural value and historical background, the age of the fabric and the level of craftsmanship at that time can be inferred. These micro evidence not only provide scientific basis for the identification of cultural relics, but also provide valuable data for the development of ancient culture and technology.

4. The limitations and remedial technique of microscope in cultural relic identification

The microscope is crucial to the identification of cultural relics, and experts can accurately judge its authenticity by analyzing the microstructure and material. However, it has limitations: non-destructive testing may damage artifacts, observation depth is limited, and sample preparation may alter heritage properties. High-power microscopes are expensive, complex to operate, and cannot provide full information about artifacts. In addition, some materials and environmental conditions limit the use of microscopes, technical limitations may also affect the analysis results, and the sample representativeness should be considered carefully. Therefore, in the identification of cultural relics, the microscope usually needs to be combined with other analytical techniques such as infrared spectroscopy, X-ray diffraction, chemical analysis and other means to obtain more comprehensive and accurate identification results[6].

Various techniques can make up for the limitation of microscope in cultural relic identification. Including: infrared spectroscopy analysis for the identification of organic and inorganic components such as pigments; Raman spectroscopic analysis provides non-destructive molecular vibration information [7]; X-ray diffraction analysis of the mineral crystal structure; X-ray fluorescence spectroscopy analysis of non-destructive analysis of cultural relics surface elements [8]; Mass spectrometry analysis for the precise measurement of the molecular mass[9]; Structure identification of organic and inorganic compounds by NMR; Quantitative analysis of the chemical composition by electron probe microanalysis; Synchrotron radiation light source provides high-energy X-rays for the analysis of deep cultural relics; 3 d scanning technology to create a 3 d model of cultural relics; Multispectral and superspectral imaging reveal hidden details; Thermal analysis and identification material with temperature change; Carbon 14 dating of organic artifacts. The selection of appropriate technology should consider the type of cultural relics, identification information and protection status. Comprehensive application of various technologies can provide a comprehensive understanding of

the history, material, technology and preservation status of cultural relics. This process not only helps researchers to study and understand the history more comprehensively, but also provides a scientific basis for the protection and inheritance of cultural relics [10].

5. Conclusion

In order to further improve the utilization, publicity and popularization of archaeological discoveries and research results, new discoveries and new understandings of popular science such as the source exploration project of Chinese civilization should be incorporated into the teaching materials in time. This will not only help to cultivate teenagers patriotism, but also to strengthen their cultural confidence and deepen their recognition of the history of the motherland. Through various forms, it is committed to spreading the excellent Chinese history and culture, so as to enhance the sense of national identity and national cohesion, and jointly build the spiritual home of the Chinese nation. As an important carrier of historical, artistic and scientific values, cultural relics can have a deep understanding of their time background, authenticity discrimination, material composition and production process through the professional identification process. The traditional identification of cultural relics mainly depends on the experience and intuition of experts. However, this method relying on expert experience has some risks of subjectivity and misjudgment, and sometimes even leads to the underestimate or misjudgment of the value of cultural relics.

With the development of science and technology, the application of microscope technology has significantly improved the scientificity and accuracy of cultural relics identification. Microscopy technology can reveal the microscopic characteristics of artifacts, such as material composition, production process details, and traces of historical times. These micro information provide an important reference for the protection and restoration of cultural relics, making the protection of cultural relics more accurate and effective. However, there are some limitations in the identification of microscope techniques. In order to overcome the limitations, it is particularly important to combine other advanced scientific and technological means. Through this method of multi-technology comprehensive application, researchers can have a deeper understanding of the intrinsic value of cultural relics, and provide more scientific and comprehensive support for the protection, restoration and research of cultural relics. The Chinese civilization has a long history of five thousand years, which needs to further explore and study its rich connotation and spiritual essence, and fully explain and publicize the outstanding wisdom contained in it. Through such efforts, more people can have a deep respect for and love for the Chinese civilization, thus enhancing national pride, and actively promoting the spirit of patriotism. The ultimate goal of protecting cultural relics is to pass on and carry forward the excellent traditional culture of China from generation to generation.

In general, the identification of cultural relics through microscope technology has brought new breakthroughs and progress to the field of cultural relics research and protection in China. The application of this technology makes the cultural appraisal work more scientific and rigorous. The use of a microscope for the research and protection of cultural relics reflects the important role of science and technology in the protection of cultural heritage, and is an effective means to promote the scientific and refined work of cultural heritage protection. At the same time, this is also in line with Chinas policy of strengthening the protection of cultural relics and inheriting and carrying forward the excellent traditional Chinese culture. Through high-tech means, cultural relics can be better protected and studied, so that these witnesses of history can be passed on, and provide strong support for the cultural confidence of the Chinese nation. Looking into the future, microscope technology will play a more important role in the field of cultural relic identification, and make a greater contribution to the inheritance and promotion of the excellent traditional Chinese culture. With the help of a microscope, the unique microscopic characteristics of different types of cultural relics can be

observed.

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