

Integration of Science and Art: Take the Micro Art Design Transformation of Material Structure Diagram Through the Combination of Material Science and Art Design as an Example

Li Sheng^{a,*}, 

^a Department of Mechanical Engineering, Faculty of Engineering, Universiti Malaya, Kuala Lumpur 50603, Malaysia

KEYWORDS

Integration of Science and Art; Material Science; Art Design; Sustainability; Material Structure Diagram; Micro Art

ABSTRACT

This paper takes the combination of material science and art design as the research entry point, and is committed to establishing a new combination of art and science in a system. Based on the development of nature and art, and with visual aesthetics as the core, explores new art forms and scientific publicity forms. In this paper, the creative practice takes the redesign of material structure diagram as an example to intuitively explain the micro beauty of material structure and the value of its artistic continuity. Finally, the integration of science and art will promote the transformation and application of scientific research achievements. This can effectively promote the development of creative design.

Introduction

In recent years, there has been an increase in interest in the topic of the fusion of art and science. Science and technology are now more diversified, creative, and conceptual thanks to its integration, which has brought forth new development trends for art design. The reworking of the material structure in this fusion environment, which incorporates material science and art design, has also drawn a lot of interest. The material structure diagram's art design can enhance the meaning of art design by using complicated structural, mechanical, and physical aspects from material science in addition to beautiful color patterns.

1. Integration of science and art

1.1 About Material Science Art Design and Micro Art

Definition of material science: Materials science is a discipline that studies the structure, performance, processing and use of materials. It combines theory, experiment and engineering. Its purpose is to explore new materials and new technologies, and to study how to make better use of existing materials. Material science is the study of material structure, properties and processability, which mainly depends on scientific experiments and engineering design. Materials science can be divided into many different disciplines according to its research methods and purposes, such as material mechanics, material chemistry, material physics, material microstructure, material processing and material application. The research contents of materials science include: mechanical properties, thermal properties, electrical properties, mechanical properties and magnetic properties of materials; Microstructure of materials and its relationship with properties; Characteristics of material surface and its processing technology;

Composition and composition of materials, and application of materials (Kakani, 2004).

Definition of art design: Art design is an effective way to deal with problems in a creative way of thinking. It is an aesthetic result of combining form, color, line and composition to achieve aesthetic satisfaction. Art design is a creative process aimed at creating novel, interesting and unique visual expression. It can be used in product design, advertising design, environmental design, landscape design, etc., in order to meet people's needs for beauty and aesthetics. Art design is not only to beautify the environment, it can also stimulate people's imagination, improve the quality of life, and enhance people's experience (Behrens, 1998). Correct art design can make people's lives more beautiful and valuable.

Definition of micro art : Micro art is an art form formed by technicians and artists. It combines small material details with grand art to produce amazing works. It involves the operation of small material, such as metal, plastic, glass, etc., and the use of micro technology to produce works of art, such as miniature furniture, sculpture, sculpture, etc. Micro art can be used to create unique works of art, and can also provide technical support for other art forms (Proper, 1887).

1.2 The manifestation of the integration of the science and art

Science and art are indispensable to human society. They play different roles in different fields. However, in recent years, more and more attention has been paid to the integration of science and art. The integration of science and art can not only stimulate more creativity, but also enable scientists and artists to better understand each other. From the perspective of artists, scientific research can provide them with a

* Corresponding author


E-mail: lisheng_lx@outlook.com (Li Sheng).

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 <https://orcid.org/0000-0001-9346-6050>



new perspective and creative inspiration, making their creations more creative and rich. From the perspective of scientists, artistic skills can help them better express their views and make their study achievements more expressive.

In addition, the integration of science and art can also improve people's literacy, stimulate their imagination and creativity, and help them better understand the world. Science makes people understand the world, while art makes us feel the world. The integration of science and art can enable people to view the world more completely, thus improving our cultural literacy. Therefore, the integration of science and art can stimulate creativity, improve people's literacy, and help people better understand the world. Therefore, the integration of science and art should be strengthened in the future to promote social development and progress (Portnova, 2019).

2 Integration of art design and material science

2.1 Artistic design of material structure drawing

2.1.1 Artistic features of material structure drawings

The types of microstructure images include scanning electron microscope images, sample surface roughness measurement images, X-ray diffraction images, pyroelectric images, atomic force microscope images, micro area laser and free electron beam images, etc. The artistic design of material structure diagram is to transform the complex and small structure, mechanical and physical properties in material science into simple and understandable graphic images to express the physical morphology, structural characteristics and physical properties of objects. The artistic design of the material structure diagram can show the aesthetic feeling of art, including the combination and collocation of colors, so that the viewer can feel the aesthetic feeling of the structure, and also can show the complex structural, mechanical and physical properties in the material science (Ashby & Johnson, 2013).

2.1.2 Artistic creation of material structure diagram

The artistic creation of material structure diagram is to transform the structure, mechanical and physical properties of materials researched by scientists into artistic forms through artists and designers to achieve artistic aesthetic effect. In the creative process of artists, the structure, mechanics and physical properties of materials should be integrated into the artistic creation, so that the artistic creation can have a unique connotation and better show the connotation of material science.

Material structure scanning diagram is an effective application of creative design technology. The use of creative design can more clearly show the detailed structure of materials, so as to better understand the nature of materials. At the same time, the use of creative design can better enhance the spatial expression of the scan diagram, making it more artistic expression and more attractive (Alberiet al., 2018).

In addition, the use of creative design can effectively improve the readability and visibility of the material structure scanning chart, making it clearer and more operable, so that the detailed structure of the material can be better controlled and adjusted, thus better improving the performance of the material. The integration of material science and art

design can be said to be a new trend in the design field in recent years. It integrates art design and material science, breaks the limitations of previous design concepts, broadens design ideas, improves design quality, and provides a good application basis for designers and design technologies.

The art design integrating material science mainly uses the theory and method of material science to analyze the structure, function, performance, process and other aspects of the design in an all-round way to meet the design requirements. This kind of fusion design can not only meet the actual needs, but also improve the performance of the product and achieve better design results. With the development of science and technology, more and more attention has been paid to art design integrating material science. More and more designers and enterprises have actively invested in this field and achieved good results. In the future, the art design integrating material science will be further developed and play an important role in the design field.

3. Design of art structure drawing

3.1 Details and precautions

- **Details of structure drawing design:** the structure drawing design shall have good visibility and operability, and the details shall be clear and unambiguous;
- **Layout and typesetting:** the layout of the structure diagram is reasonable to make it beautiful and generous, which is helpful for readers to understand;
- **Color of the structure diagram:** the color should be used properly, not too complex, bright in depth, so as to make the structure diagram more beautiful;
- **Font of structure diagram:** the font selection shall be reasonable and concise, which shall not only have beautiful visual effect, but also express clear information.

3.2 Contents of art structure drawing design

- **Content requirements:** the structure diagram shall have relatively complete contents, which shall be improved according to the actual situation and include necessary contents;
- **Accuracy:** the content in the structure diagram should be accurate without any mistakes, otherwise it will affect the readers' understanding;
- **Readability:** The content of the structure diagram shall be easy to read, and attention shall be paid to the size, color and clarity of the text;
- **Integrity:** The contents in the structure diagram shall be able to completely express the elements constituting the structure diagram and the relationships between them without omission.

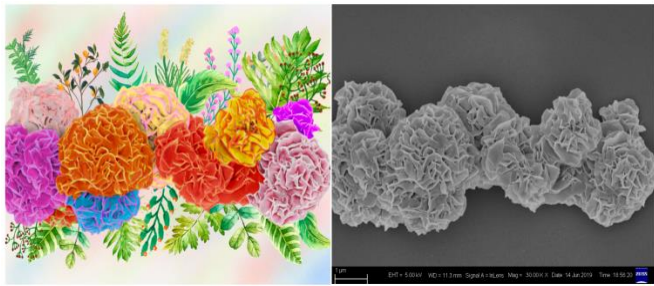
3.3 Display of artistic design results of material structure drawings

The material structure diagram art design display usually uses the material structure diagram taken by high-precision electron microscope for artistic creation, which is used to express abstract concepts or build complex systems, such as social relations, institutional structure, character relations, etc. The structure diagram artistic design display

usually uses the bright color image and the succinct text. Pictures are used to express abstract concepts, and words are used to provide more information. They can be used together or independently to convey information effectively (Sydor et al., 2021).

The effect picture of material structure drawing art design can be displayed on various media, such as print, graphic design, web design, etc. They can be used to convey abstract concepts and enhance the demonstration effect. In addition, they can help the audience understand complex systems and improve visibility. The advantage of structure diagram art design display is that they can effectively convey complex concepts, promote the latest scientific research achievements through artistic means, and also give the audience visual enjoyment.

The following five works are the patterns obtained through artistic creation according to the electronic structure diagram taken by the electron microscope after the physical or chemical reaction of some materials. As shown in Figure 1, it is the scanning electron microscope image of nickel based metal organic skeleton materials are synthesized through hydrothermal reaction of nickel nitrate and terephthalic acid. Through artistic design, colorful art drawings are obtained. Each metal skeleton is decorated as a flower, and various leaves are matched.



Picture Source: The original scanning electron microscope image was taken by the research team of Professor Li Yao of HIT

Fig. 1. Comparison of design before and after the hydrothermal reaction synthesis diagram of nickel nitrate and terephthalic acid for nickel based metal organic skeleton materials.

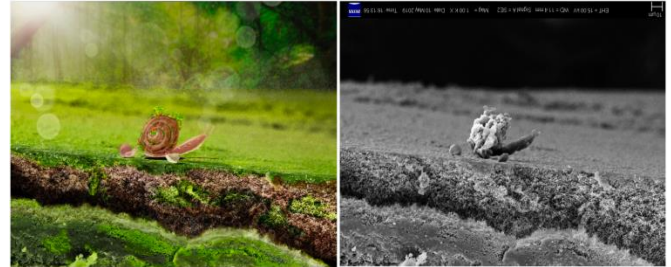
As shown in Figure 2, it is the scanning electron microscope image of opal photonic crystal structure that responds to water. Through artistic creation, it becomes a man standing on the vast planet, embracing and shouting at all things in the universe and the giant planet in front of him, and can see the yearning for new things.



Picture Source: The original scanning electron microscope image was taken by the research team of Professor Li Yao of HIT

Fig. 2. Comparison of design before and after the microscopic image of opal photonic crystal structure film in response to water.

As shown in Figure 3, it is the scanning electron microscope image of the sulfuric acid perchloric acid doped polyaniline film. After artistic creation, it has become a vivid picture. A snail with two baby snails slowly crawls in the deep sunny forest, full of artistic conception of parent-child and life.



Picture Source: The original scanning electron microscope image was taken by the research team of Professor Li Yao of HIT

Fig. 3. Comparison of design before and after the scanning electron diagram of polyaniline film doped with sulfuric acid perchloric acid.

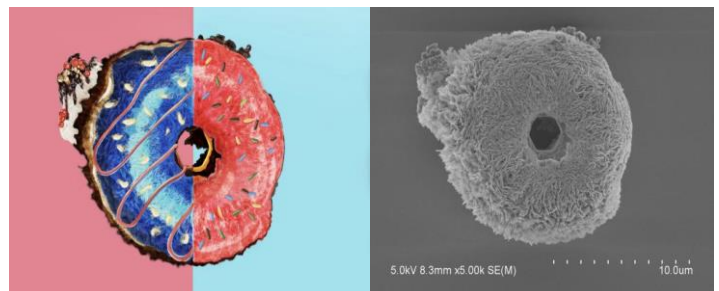
As shown in Figure 4, it is the scanning electron microscope image of the section scanning of the perchloric acid doped polyaniline film. After artistic creation, it becomes a beautiful picture of sunflower fields under blue sky and white clouds, with bright colors, showing the joy of harvest.



Picture Source: The original scanning electron microscope image was taken by the research team of Professor Li Yao of HIT

Fig. 4. Comparison of design before and after the scanning electron microscopy of cross section of polyaniline film doped with perchloric acid.

As shown in Figure 5, it is the scanning electron microscope image of magnetron sputtered nickel oxide film. Through artistic creation, it has become a doughnut with two halves of different colors spliced together. The prominent part is decorated with mouth watering ice cream, which is bright in color and contrasted strongly, showing the happy moment of tasting food.



Picture Source: The original scanning electron microscope image was

taken by the research team of Professor Li Yao of HIT

Fig. 5. Comparison of design before and after the scanning electron microscope image of magnetron sputtered nickel oxide film.

The above creative works are part of the achievements of the research project cooperated by Professor Li Yao of Harbin Institute of Technology. The new study results of rigorous and scientific material engineering (New Material Microstructure Diagram) are designed in plane, which increases interest and visual impact. The creation of relevant cultural and creative products has played a very good role in spreading to universities, this field and other areas of society.

3.4 The manifestation of the integration of the science and art

For this study, the greatest significance is to promote the transformation and application of scientific research achievements. This can effectively promote the development of creative design. The transformation and application of scientific research achievements can use science and technology to create more surprises and innovations in creative design (Rose & Parker, 1994).

To transform scientific research achievements into creative design, it is necessary to combine existing traditional creative design concepts and transform scientific research achievements into effective tools that can be used in creative design. For example, scientific and technological achievements can provide the most advanced design tools, as well as more complex analysis and simulation technologies, which can more accurately capture the essence of design and greatly improve the efficiency and quality of creative design. To apply scientific research achievements to creative design, it is necessary to transfer technology and transform scientific research achievements into application technologies that can be directly applied to creative design. For example, new materials and technologies found in scientific research achievements can be directly applied to creative design, which can

create more innovative creative design products. Through systematic development, to achieve the effective application of creative design. For example, when applying scientific research achievements to creative design, it is necessary to transform scientific research achievements into features that can be recognized by computers, so as to realize effective support for creative design.

Conclusion

The art design of material structure diagram can integrate the complex structure, mechanics and physical properties in material science, transform science into art, thus enriching the connotation of art design, making art design more diversified, innovative and conceptual. Therefore, the art design of material structure diagram is a new form of art design, which provides a new possibility for the integration of material science and art design. Looking back at the development of human history, art and science have never been separated. Their integration has stimulated people's infinite creative potential, and has had a profound impact on human's material and spiritual world. In the future, we hope that cutting-edge science and technology, culture and art will stimulate more innovative sparks in the new collision, so that we can feel more abundant beauty of art and science.

References:

- [1] Kakani, S. L. (2004). Material science. New Age International (P) Ltd., Publishers..
- [2] Behrens, R. R. (1998). Art, design and gestalt theory. Leonardo, 31(4), 299-303.
- [3] Propert, J. L. (1887). A History of Miniature Art: With Notes on Collectors and Collections. London: New York: Macmillan and Company.
- [4] Portnova, T. V. (2019). Integration of science and art in the study of Renaissance art culture. Perspectives of Science & Education, 41(5).
- [5] Ashby, M. F., & Johnson, K. (2013). Materials and design: the art and science of material selection in product design. Butterworth-Heinemann.
- [6] Alberi, K., Nardelli, M. B., Zakutayev, A., Mitas, L., Curtarolo, S., Jain, A., ... & Perkins, J. (2018). The 2019 materials by design roadmap. Journal of Physics D: Applied Physics, 52(1), 013001.
- [7] Sydor, M., Bonenberg, A., Doczekalska, B., & Cofta, G. (2021). Mycelium-based composites in art, architecture, and interior design: a review. Polymers, 14(1), 145.
- [8] Rose, P., & Parker, D. (1994). Nursing: an integration of art and science within the experience of the practitioner. Journal of Advanced Nursing, 20(6), 1004-1010.
