

A Research on Comprehensive Application of Materials in Contemporary Metal Device Design

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Abstract: Traditional metal crafts mainly use metal materials such as gold, silver, and copper. Their main features are functional and decorative and they have many sacrificial uses. People use precious metals to show their noble bodies and status and pay more attention to the value of the materials themselves. The influence of contemporary artistic thoughts makes artists try to apply various materials to their designs, and they become more concerned about the emotional thoughts expressed in their works. Metal and other materials bear the spiritual connotation that artists want to express, and reflect the openness, tolerance and diversity of contemporary culture. They are influenced by different contemporary artistic ideas so they pay more attention to humanistic feelings. It breaks the bondage that only precious metal materials can be used in metal crafts and applies materials with different colors, and textures to the design of metal crafts.

Keywords: Metal; Device; Materials; Comprehensive Application

1. The Concept of Metal Device

Metal devices are artistic objects which are mainly made of metal materials, supplemented by other nonmetallic materials, and processed by forging and casting. Metal handicrafts not only reflect the level of social production, science, and technology but also the sustenance of the human spirit. In the history of Chinese arts and crafts, it is believed that the metal crafts of various countries in the world are owned by a few people, symbolizing their noble bodies and status. In the history of western art, the industrial revolution is a watershed. Before the industrial revolution, art design remained in the mode of individual craftsmen, and metal crafts belonged to the category of pure art. After the industrial revolution, the progress of science and technology led to the extensive use of metals. Arts and crafts appeared in large numbers and were constantly combined with other art forms.

2. Classification and Characteristics of Materials

2.1 The classification of materials

Material is the material basis and carrier of metal device design. The characteristics of the material itself can reflect the design idea that the artist wants to express. Therefore, the understanding, research, and application of materials become particularly important. Throughout history, the development of materials has gone through a long process from the materials such as stones and bones used in primitive times to the later use of various metal materials, and then to the application of contemporary comprehensive materials.

2.2 Concepts and characteristics of different kinds of materials

Metal appears in all aspects of people's daily life as an indispensable material in contemporary life. Materials generally have metallic luster and plasticity as well as electrical and thermal conductivity. All kinds of metal materials are collectively referred to as metals and metals are divided into ferrous metals and nonferrous metals. Black metals include iron, manganese, and chromium, and other metals are non-ferrous metals.

Wood is a renewable resource, while metals, plastics, and other materials are non-renewable resources. Therefore, wood

is often used as a raw material for artistic creation by designers. Wood has strong compression resistance, good elasticity, and strength.

Stone is mainly divided into natural stone and artificial stone. Natural stone is made from natural rocks, mainly granite, marble, and slate. Man-made stone refers to the building materials manufactured by imitating the structural characteristics, and physical and chemical characteristics of natural stone.

Glass is an inorganic amorphous nonmetallic material, and its main raw materials are inorganic minerals such as quartz sand, borax, and limestone. Silica is the main component of glass, which also contains other oxides. Natural glass is naturally formed glass, and artificial glass is an amorphous body made by man. Glass is transparent, plastic, reflective, and colorful. Glass technology includes hot-melt glass, forged glass, and crystal-colored glass. The glass-making methods can be roughly divided into three categories, which are hot working type, cold working type, and compound working type.

Paper is also known as matte felt paper. The raw materials for making paper contain plant fibers and the processing technology of paper includes pulping, brewing, papermaking, and processing. Leather includes two categories: natural leather and artificial leather. Natural skins mainly include pig, sheep, ox, donkey, horse and kangaroo skins, etc. The unique textures of the leather surface have become the reason why artists choose leather as a design material.

The main component of plastic is natural resin or synthetic resin. They can be molded into a certain shape under high temperature and pressure by adding additives but the shape remains unchanged at room temperature. Therefore, artists can freely use plastic materials as raw materials for artistic creation. Materials composed of continuous or discontinuous filaments are called fibers, which can be divided into two categories: natural fibers and chemical fibers.

3. The Case Analysis of Works Combining Metal with Other Materials

3.1 The combination of metal and wood

Artist Phil Young's works are artistic works that combine metal with wood. The hardwood in his works looks like soft cotton, which is stretched, tied, and twisted by metal rings and nails. His works arouse people's surprise by the pressure of metal on wood. Phil discovers the inner connection between humans and the material by exploring the touch of the material itself.

Figure 1 and 2 "Stretch" and "Nail" by Phil Young. Redwood, ash and stainless steel 99*99*5cm, 24 * 20 * 5.5cm



3.2 The combination of metal and glass

Mary Shaffer is a famous American glass artist. Mary Schaefer's works usually combine glass with metal materials. Mary Schaefer's "Hanging Series" captures the melting state of glass in a metal frame. She used different shapes of metal wires and metal nets as supports, heated the glass, and attached it to the supports until the glass reached certain flexibility. Moreover, it could flow naturally under the influence of gravity and eventually form different shapes. The works of "Hanging Series" visually give people a contrast between softness and hardness.

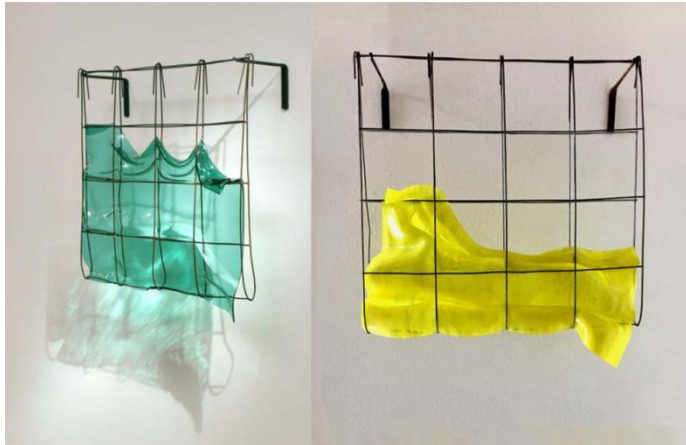


Figure 3 and 4 Mary Schaefer's Water Line and Yellow Field, 3.5*61*20.3cm, 68.6*61*27.9cm glass and metal

3.3 The combination of metal and silica gel

Hannah Levy's works break down the common and easily overlooked items in our daily life and then re-create the combination to personify the objects. Levy's works are mainly made of steel metal and silica gel with nickel plating on the surface. She described the items that she used as "design purgatory" such as medical equipment and swimming pool handrails. These medical and sports equipment and safety railings no longer only appeared in their fixed environment but they got rid of the bondage of human beings. Levy carried these instruments to the art exhibition hall, and made new skin prostheses for them with silica gel materials, further complicating the definition of objects. Her works have changed people's inherent understanding of objects and expressed the other side of existing objects.



Figure 5 and 6 "Untitled" by Hannah Levi. Nickel-plated steel, silica gel 152.5*178*216cm, 172*188*188cm

4. The Design Practice

4.1 The inspiration for Occupy Series

There are a lot of frictions between parents and children in society. Personal space in life is invaded from time to time. My work is to explore how to better pursue the independence of personal space and cultivate people's self-awareness and sense of security by studying the distance between people and experimenting with metal and other materials.

4.2 Design process and 3D model renderings of Occupy Series

Edward Hall, an American psychologist, first mentioned the theory of private space and spatial relations in his book *Hidden Dimensions*. He believes that the distance between people can be divided into four types: intimate distance, personal distance, social distance, and public distance. Intimate distance means that the distance between two people is within 45cm, and they can feel each other's temperature and breath. Personal distance is between 45-120cm, which generally refers to the informal situation between family and friends. Social distance is between 120-360cm, which is generally the distance to talk to each other with a sense of security. The public distance above 360cm refers to the distance of strangers in public.

Around 1990, scientific researchers discovered that there was a kind of neuron in the human brain that could observe the situation around its body. They would retreat and defend against the change of the distance between the body and the surrounding objects. Researchers called them "bubble neurons".

I also looked up the concept of "flying area" of animals and that is "escape distance". I chose four kinds of animals to combine with four kinds of distances. The cocoon corresponds to the intimate distance, and the insect will cocoon to protect itself. The intimate distance represents the lover and the distance is the shortest one among the four distances. The bird's nest represents personal distance and personal distance refers to the distance between family members and friends. Bird's nest corresponds to family members. Ants' nests correspond to social distance, and the internal passages of ants' nests are complex. Although each nest is independent, it is connected. Spider webs represent public distance. Spider webs are larger and longer in size compared with ant nests. I combine four kinds of distances, four kinds of animals, and elements of neurons to design.

The work "Occupy Series I-Insect Cocoon" extracts the plant branch elements from the living environment of insect cocoons and combines them with neuron elements. The meridians and branches of insect leaves are used as supports, and a layer of cocoons is formed around them as protective covers for survival. The work is a device that is worn on the heads of two people standing face to face and is a combination of metal and comprehensive materials.



Fig. 4-1 3D modeling effect of Occupy Series I-Worm Cocoon drawn by the author.

The work "Occupy Series II-Bird's Nest" is an element extracted from the bird's nest shape, which is analogous to the distance of human beings. It combines the bird's nest shape with neuron elements to make a three-dimensional device combining metal and comprehensive materials.



Figure 4-2 3D modeling effect of Occupy series II-Bird's Nest painted by the author

The work Occupy Series III-Ant Nest extracts elements from ant nests. The internal passages of ant nests are complex. Although each nest is independent, it is connected with the other. It is used to compare the social distance of human beings and shaking hands symbolizes socialization. This part of the work is an interactive device created based on humans shaking hands.



Fig. 4-3 3D modeling renderings of "Occupy Series III-Ant Nest" drawn by the author.

The work "Occupy Series IV-Spider Web" extracts elements from spider webs and compares spider webs with the public distance. The public distance above 360 cm refers to the distance of strangers in public places.

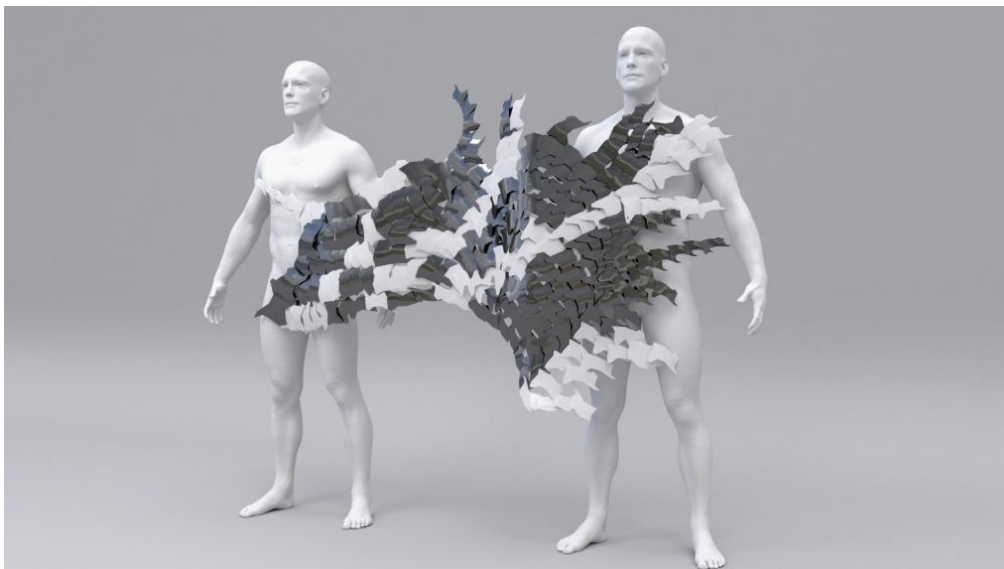


Fig. 4-4 3D modeling effect of Occupy Series IV-Spider Web drawn by the author

4.3 Material experiment of Occupy Series

The metal copper material is selected to be combined with pulp, glass fiber, quartz sand, and other comprehensive materials. The combination of hard metal texture and soft pulp creates a rich visual effect. Paper gives us a fragile feeling, symbolizing the fragile relationship between people. Materials for the experiment include brass wire, rice paper, glass fiber, quartz sand, and white latex. Although the paper itself is easy to be damaged, it will become very hard when the wet pulp is

combined with glass fiber and white latex and dried. It symbolizes a tough confrontation to maintain our personal space.

Conclusion

With the continuous development of human society, artists' understanding of the use of materials in artistic works has undergone great changes from traditional natural materials to innovative artificial materials. The design of metal arts changes from the symbol of power and status to the artistic carrier of artists' emotional expression. The involvement of various other materials in the design of traditional metal crafts can express artists' various design thinking through different textures and cultural connotations of materials. Contemporary artists of metal craft design gradually stepped out of the situation of using traditional materials alone and designed rich handicraft forms.

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