

# Selection and research of green building materials in the new era

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**Abstract.** When using traditional building materials, due to its high cost and unable to guarantee the quality, it will not only cause hidden dangers of construction quality, but also sometimes the materials may contain toxic carcinogens, endangering people's life, health and safety. The use of green building materials can carry out safety and quality control around the three links of raw material manufacturing, use and recycling, reduce the environmental load and protect human health at the same time, and after the investment of green building materials, it can meet the needs of the sustainable development of the construction industry and reduce the waste of energy and natural resources. It is also non-toxic, harmless and pollution-free. It has a long service cycle and will be used more widely.

**Keywords:** New Eranatural resources; green building materials; non-toxic,; harmless; sustainable development.

## 1. Introduction

Construction industry is a highly polluting industry. In China's industrial energy consumption, the production of iron and steel, non-ferrous metals, chemical industry and building materials accounts for more than half of the total industrial energy consumption. The sum of iron and steel, building materials and chemical industry in most developed countries is very low. In China, a large amount of non renewable energy is used for the construction of buildings and infrastructure. The production energy of construction consumables accounts for about 40% of the total industrial energy consumption in China. Carbon emissions related to energy consumption in the production and transportation stage of building materials and carbon emissions in the process of cement production industry are the main parts, accounting for 65% and 30% respectively. Among many building systems, green building emphasizes the environmental protection, energy conservation, naturalness and coordination of buildings, and has the characteristics of green, nature, environmental protection, health and comfort. At the same time, green building has special cultural connotation and artistic value. More and more architects choose green building materials to alleviate the problems of energy consumption and environmental pollution caused by the construction industry, put the awareness of energy conservation into the whole architectural design, fully integrate green and beauty, and excavate and reflect the artistic expression of green building materials.

## 2. Overview of green buildings and materials

### 2.1 Overview of green building

In the new era and new development, modern green building materials are divided into two categories: reusable materials and recyclable materials. Reusable materials are materials that are directly used or reused after fusion and repair without changing the form of recycled materials; Recyclable materials are those materials that cannot be reused directly. By changing the form of materials, another new material is generated, and then recycled for many times. Reusable materials mainly come from construction wastes, including various solid wastes generated in the whole life cycle of buildings such as construction process and demolition of abandoned buildings; Recyclable materials mainly come from the recycling of industrial waste, agricultural waste and domestic waste. Green building materials have the characteristics of low energy consumption and low pollution, such as high-quality cement produced by modern technology and technology; Some can improve the

indoor ecological environment, such as multifunctional glass, ceramics and coatings that can resist bacteria and regulate temperature; Some achieve the purpose of saving resources by reusing a large number of industrial waste and agricultural waste, such as cement materials that can purify water and solidify harmful industrial waste residue.

## 2.2 Overview of green building materials

When using traditional building materials, due to its high cost and unable to guarantee the quality, it will not only cause hidden dangers of construction quality, but also sometimes the materials may contain toxic and carcinogenic substances, endangering people's life, health and safety. The use of green building materials can carry out safety and quality control around the three links of raw material manufacturing, use and recycling, reduce the environmental load and protect human health at the same time, and after the investment of green building materials, it can meet the needs of the sustainable development of the construction industry and reduce the waste of energy and natural resources. It is also non-toxic, harmless and pollution-free. It has a long service cycle and will be used more widely. The characteristics of green building materials are as follows: (1) in the production of raw materials, some wastes, such as tailings and garbage, are mainly used to replace those natural resources that cannot be regenerated; (2) The selected manufacturing process has low energy consumption and no technology pollution; (3) In the process of manufacturing products, formaldehyde, halide solvents and aromatic hydrocarbons are not used, and there are no additives of mercury and compounds in the products; (4) Highlight the effect on people's health in product design; (5) Can be recycled and recycled.

## 3. Types of green building materials

There are four basic types of green building materials: basic type, energy-saving type, recycling type and health type.

**Basic type:** it can meet people's basic use needs and is harmless to human body. This is also the basic requirement of building materials. In the process of production and use, reduce the use of harmful chemicals, and eliminate excessive harmful substances in products, such as formaldehyde and ammonia. Synthesis, using production processes and equipment that reduce heat loss and promote the improvement of thermal efficiency.

**Energy saving type:** the process used is low energy consumption, such as burning free and low-temperature synthesis, and the production process and equipment that reduce heat loss and promote the improvement of thermal efficiency are adopted. Energy saving can be achieved in the use of products, such as selecting thermal insulation materials with energy saving of more than 30%. At the same time, we need to strengthen the development of other new green materials, such as the use of solar energy.

**Recycling type:** in the process of production and manufacturing, select new processes and technologies, and make more use of waste residue, tailings and garbage to realize sustainable recycling. For example, in Japan, sewage sludge is used to make ecological cement, and the slag ash from waste incineration is used to make ceramic building materials, which can ensure the reuse with a recovery rate of more than 90% and will not cause environmental pollution.

**Healthy:** the main purpose of designing products is to improve the living environment and promote the improvement of people's quality of life; When using new healthy products, it can achieve antibacterial and mildew resistance, deodorization, temperature regulation and radiation protection.

## 4. Selection of green building materials in design

### 4.1 application of energy-saving materials

The biggest advantage of energy-saving materials is that they can save resources. For scarce building materials, we can choose to use some energy-saving materials to replace them, which can

not only save energy, but also have properties that can not be replaced by other materials, and can be widely used in the construction industry, such as some thermal insulation glass, composite plates, etc., which are environmental protection building materials.

#### **4.2 application of pure natural building materials**

Pure natural building materials mainly use some natural resources, such as solar energy and geothermal energy. In production, the full use of these energy sources can combine building materials with natural energy to form newer building materials, which has a strong effect of environmental protection and energy conservation.

#### **4.3 promoting environmental harmony**

Promoting environmental harmony in the process of architectural design, we need to realize the effective combination of architecture and surrounding environment, so as to achieve the purpose of harmony and unity. We can not destroy nature simply for people's production and residence; It is necessary to deeply study the surrounding environment, maintain ecological balance and reduce or eliminate environmental pollution as much as possible. Architectural modeling design must be carried out from different angles to meet different landscape needs. At the same time, it also needs to be effectively combined with architectural characteristics to choose a more appropriate architectural way. We should build forest land and green space, combine the buildings with the surrounding green environment, and make the living environment more in line with the "green concept".

#### **4.4 realize the organic combination of materials**

Fully consider thermal insulation and heat insulation to ensure that the thermal insulation and heat insulation meet the regulations and requirements of green building production in China. For example, when designing the exterior wall and roof of a building, it is not only necessary to prevent water seepage of the insulation layer, but also to avoid condensation inside and prevent mildew. Therefore, in the design, we can not choose hollow block materials and avoid the use of lightweight materials. At the same time, we should also prevent the selection of dark materials in the wall layer as decoration, otherwise it will affect the roof insulation of the building and the effect of external wall insulation.

#### **4.5 selection of building materials**

In order to better realize the concept of energy conservation and environmental protection, in the process of building design, we must fully combine with high-tech technology, reduce the application of synthetic materials, choose more clean and pollution-free energy, make full use of the construction waste generated in the city, and do a good job in processing and recycling. In addition, it is also necessary to ensure the rationality of building material selection, ensure its pollution-free and reduce the harm to residents. In the selection of materials, we also need to pay attention to their basic properties, such as fire prevention, heat insulation and sound insulation effects. Strictly implementing recyclability can not only meet people's comfort needs, but also meet the requirements of energy conservation and environmental protection. Therefore, in the construction design, the full combination of science and technology and building materials is an important way of building material innovation.

### **5. Value embodiment of green materials**

#### **5.1 Practical value**

Different building materials will show different effects in different production practices. In consideration of environmental protection and resource conservation, we should pay attention to the use of local materials and improve the reuse rate of materials. Green building materials have great advantages in future architectural design. Architects gradually realize the practical value of green

building materials. Through their in-depth understanding and continuous research of materials, they flexibly apply them to architectural design, fully reflecting the importance and uniqueness of green building materials. The Ningbo Museum, designed by Chinese Architect Wang Shu, is located in the west of the central square in Yinzhou District, Ningbo. The overall appearance of the building is dignified and magnificent. The facade of Ningbo Museum is composed of broken bricks and tiles of different sizes and colors, which are collected from the surrounding demolition sites and combined through the "tile valve" technology. There are also many old objects left over from the Ming and Qing Dynasties in the old city of Ningbo, such as keel bricks, green bricks engraved with the words "Fu" and "Shou". Recycling and reusing building materials with traditional significance is not only the inheritance of the characteristics of ancient buildings in Ningbo, but also carries forward Chinese traditional culture.

## 5.2 Artistic value

In addition to protecting the environment and saving energy, compared with ordinary building materials, green building materials have unique scientific and technological beauty and are easy to combine with contemporary building technology, making architectural design more modern and scientific. For example, the use of glass materials in buildings has a long history, from classical churches to today's high-rise buildings. The production technology of glass materials is becoming more and more mature. With the development of architectural technology, its forms of expression are becoming richer and richer. The facade of the building adopts glass and concrete materials, and the concrete panel and glass materials are arranged in a horizontal staggered manner. From a distance, it is difficult to distinguish the two materials. Only a close look can distinguish the different textures of the two materials. The designer combines the overall volume of the building with the texture, texture and decoration of the building surface materials. At the same time, the images processed on the glass and concrete panels show the themes of history, technology and art, and increase the artistic expression of the building facade.

## 6. Conclusion

Green building helps to improve economic, social and environmental benefits. The development of green building is an inevitable trend. In order to promote the sustainable development of green buildings, the use of green building materials is one of the essential links. With the progress of science and technology, the value of green building materials is not only reflected in environmental protection, economy and practicability, but also more reflected in its artistry. The real color and texture, unique regional cultural connotation and ecological beauty of green building materials can not be replaced by other materials. In the process of architectural design, architectural designers should not only pay attention to technology, but also pay more attention to the artistry of materials, so that green buildings can not only fully adapt to the development of society, but also meet people's aesthetic needs.

## References

- [1] Ju Yiwen Discussion on the relationship between green building design and green energy-saving buildings [J]. China residential facilities, 2020 (10): 45-46
- [2] Ju Yiwen Discussion on the application of green building design concept in architectural design [J] ceramics, 2020 (10): 25-27
- [3] Ma Xiaobo Application of energy-saving, green and environment-friendly building materials in engineering [J] building materials and decoration, 2020 (20): 41-42
- [4] Qiu Miaoren On the application of green building materials in building energy conservation [J] residential buildings, 2020 (18): 37-38

- [5] Lu Limian Research on the development and application of green building materials [J] residential buildings, 2020 (15): 194-195
- [6] Yang Binhong Specific application of green building design in construction engineering [J] building materials and decoration, 2020 (2): 111-113
- [7] Zhang Weidong Application of green building materials in Architecture [J] Building materials technology and application, 2019 (3): 31-32