

Original Research Article

Analysis of Strengthening the Application of External Wall Insulation Materials in Green Building Energy Saving Project

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Abstract: For the development and progress direction of contemporary construction industry, greening has always been one of the most important topics, which is basically consistent with China's guidelines on environmental protection and resource conservation, with emphasis on whether it can effectively improve the ecological environment quality in urban areas, control various hazards caused by pollution, and build a healthy urban environment for people. Nowadays, the building materials market has also developed in an all-round way, and the types of materials for exterior wall insulation are also increasing. Relatively, the practical application difficulty of various technologies in the construction industry also shows an increasing trend. In order to better highlight the important role of insulation materials for green buildings, this paper will explore the application of exterior wall insulation materials with strong energy saving in green buildings.

Keywords: Energy-Saving Buildings; External Wall Insulation Materials; Application Exploration

At this stage, due to the continuous development of architectural skills and technology, people began to gradually improve their understanding of the concept of environmental protection, and at the same time promoted the overall improvement of architectural skills standards to a certain extent. Not only new energy-saving building environmental protection materials are widely researched and developed, but also their energy-saving technologies are relatively widely used. To ensure building energy conservation, the indispensable basic condition is to use green energy-saving and environmental protection building materials. On the basis of improving the building's own thermal insulation performance, it can also save energy loss to the maximum extent, actively cover people's living environment, and continuously promote the building industry to carry out the concept of green energy conservation and environmental protection,

and further promote the continuous development of construction enterprises.

1. The significance of using green environmental protection and energy saving materials for building exterior walls

At present, China's urbanization is getting faster and faster, and the proportion of building energy consumption in the country has exceeded one quarter, and this proportion is still increasing year by year. The importance of doing a good job in building energy conservation has become increasingly prominent, and the research and development and use of new ecological green materials have become the mainstream of the times. In recent years, China has formulated many building ener-

gy-saving schemes, with special emphasis on the application of renewable building materials in the construction industry, increasing the research and development of new eco-friendly building materials, classifying building materials into green environmental protection grades, and implementing the certification system of green building materials and environmental protection products, which makes the application range of green building materials in the construction industry wider and wider. Selecting suitable external wall insulation materials can save energy consumption and prolong the service life of buildings.

2. The evaluation and analysis of green energy-saving building exterior wall insulation materials

2.1 Evaluation and analysis of thermoplastic insulation materials

At present, the EPS polystyrene board produced by most manufacturers in China only has the combustion grade of B2, and few manufacturers can produce the combustion grade of B1, which is also required to have the fire protection grade of B2 in the national standard and local grade regulations. The fire protection grade of EPS polystyrene board after finishing plastering mortar has also been improved to some extent, even reaching the grade requirement of A-class incombustibility. However, its deformation temperature is only from 70 °C–98 °C, if it exceeds this temperature, it will cause its EPS polystyrene board to soften and burn. In contrast, XPS board is only graded by B2-level combustion. If XPS board can achieve A-level fireproof performance after plastering, its softening temperature also reaches 110 °C, and its flame retardant effect is obviously better than EPS board.

2.2 Evaluation and analysis of inorganic thermal insulation materials

In view of the external wall thermal insulation buildings, some better thermal insulation materials and perfect construction technology will have an ideal effect. In addition, the scientific and reasonable thermal insulation system is mainly to ensure the fire safety of the thermal insulation system itself. When researching and developing new thermal insulation systems, the conditions of green, environmental protection and water

absorption must be taken into consideration, and the production cost and use intensity also need to be comprehensively analyzed. For inorganic thermal insulation mortar, it is an inorganic thermal insulation material represented by expanded vitrified beads, and it is also a new material that can be used to paint inner and outer walls. It is mainly based on its light inorganic thermal insulation particles as aggregate mixed anti-cracking additives and cementitious materials, which has the functions of fire prevention, heat insulation and anti-aging.

3. The characteristics analysis of exterior wall insulation materials of green energy-saving buildings

3.1 Thermoplastic insulation materials

Thermoplastic thermal insulation material refers to plastic products which can be softened by repeated heating in a specific temperature range, molded or extruded in the softened state, and finally hardened by cooling. At present, EPS board (molded white polystyrene board, molded gray graphite polystyrene board) and XPS board (extruded polystyrene board) are widely used. EPS board usually has a combustion grade of B2, but after surface plastering treatment, the fire protection grade can be greatly improved, even reaching the A level, but the high temperature resistance is insufficient, and the highest temperature can only reach 98 °C, which will lead to the softening and combustion of EPS polystyrene board. Compared with EPS board, the combustion grade of XPS board is only B2, but the fireproof performance after plastering treatment is better than EPS board, with softening temperature up to 110 °C and better flame retardant performance^[1].

3.2 Thermosetting insulation materials

Thermosetting insulation materials refer to resin materials that can't soften after being heated and cured, and belong to organic insulation materials. Common thermosetting insulation materials include phenolic foam, polyurethane rigid foam and so on. It has the foam carbonization phenomenon when encountering high temperature or open flame, but it does not melt or melt dripping. Phenolic foam is made by foaming thermosetting phenolic resin, which belongs to organic polymer rigid foam products. It has the characteristics of high closed cell ratio, good heat insulation, low thermal conductivity,

good water resistance, low density, good flame retardancy, no dripping at high temperature, no toxicity and smoke, etc. It can be used in a wide temperature range (-196 °C–200 °C), and its general combustion grade can reach B1-A level. It is a thermal insulation material with excellent flame retardancy at present.

3.3 Inorganic thermal insulation materials

Inorganic thermal insulation materials are made of pure inorganic materials, which have good thermal and chemical stability, simple construction, low cost, wide application range, environmental protection, no pollution, high strength, high flame retardant grade (up to Grade A), and good thermal performance, mildew-proof effect and economy. At present, inorganic thermal insulation mortar widely used in buildings is a good thermal insulation material for external walls, which is mainly composed of light inorganic thermal insulation particles, anti-cracking, cementitious materials and other fillers. It is suitable for external thermal insulation plastering engineering and internal thermal insulation engineering of various building walls. With the requirements of low-carbon economy in China, inorganic thermal insulation materials will develop more and more.

4. The application of green environmental protection and energy-saving insulation materials in external wall insulation

4.1 Wall insulation

First, external wall internal insulation technology. The external wall internal insulation technology adopted at the beginning in China is mainly characterized by convenient construction and low cost. Its main technologies include internal insulation board, internal insulation mortar, internal spraying of rigid foam polyurethane and fixing of internal insulation layer. Among them, the most representative exterior wall insulation materials are EPS board and gypsum composite insulation board, which meet the energy-saving requirements on the premise of lower construction cost, and become a widely used exterior wall internal insulation form in northern heating areas of China. In addition, some construction units use expanded perlite or silicate insulation mortar, which also has good results. However, after a period of practice, it is

found that the external wall internal insulation technology is gradually abandoned in severe cold areas because of the phenomena of cold condensation and mildew on the internal wall, and the quality of production and construction is difficult to be guaranteed. Second, external insulation technology of external wall. After a large number of engineering application practices in recent decades, the external wall thermal insulation technology has formed a relatively sound and standardized construction system. Heat preservation of buildings can be realized by sticking fixed insulation boards on external walls, pouring EPS insulation boards into walls, hanging EPS or XPS insulation boards, spraying polyurethane insulation layers on external walls, mortar+insulation boards and composite curtain wall insulation layers, among which EPS insulation boards+thin plastering external wall insulation technology is the most mature. At present, in order to increase the anti-crack ability of exterior wall plastering layer, many construction units use polymer to improve its strength and elasticity, and cover it with glass fiber grid cloth with good alkali resistance, and finally coat it with insulation coating, which has become the mainstream technology system of exterior wall insulation and energy saving. In the research and development of slurry, inorganic thermal insulation slurry and rubber powder polystyrene thermal insulation slurry are gradually applied. Generally speaking, composite thermal insulation technology has gradually become the main direction of building thermal insulation research and development. The third, is external wall sandwich insulation technology. The biggest difference between external wall sandwich insulation technology and external wall insulation and internal insulation is that the insulation layer is located between internal and external walls, including composite masonry sandwich, cast-in-place wall built-in insulation board sandwich and assembled light steel skeleton sandwich, etc., to achieve the building insulation effect. Its main feature is low cost, but it is prone to thermal bridge effect, which requires strict control during construction to ensure thermal insulation effect.

4.2 Energy-saving glass and special roof materials

At present, some super-large buildings basically adopt the glass curtain wall which combines mirror glass

and ordinary glass to realize the external wall insulation effect, and the inter layer is injected with dry air or inert gas to form a hollow space. Nowadays, the glass curtain wall is mainly divided into open frame glass curtain wall, hidden frame glass curtain wall and point glass curtain wall, which has the advantages of high light transmittance, strong heat insulation performance, good wind pressure resistance, good sound insulation performance, moisture resistance and easy cleaning. The use of glass curtain wall can fully reflect the appearance aesthetics of buildings, and organically integrate building energy conservation and structure. But at the same time, there are some problems, such as heavy light pollution, high energy consumption, poor high temperature resistance, etc., and the structural adhesive bonded to glass is prone to aging, which leads to the fall of glass curtain wall^[2].

4.3 Other new energy-saving and thermal insulation materials

On the premise of ensuring the construction quality, reducing the consumption of building materials and reducing the energy consumption of central air conditioning is the ultimate goal of adopting new thermal insulation materials. First, energy storage wallboard is used, which is a new type of green energy-saving and environmental protection material. Gypsum board, concrete board and thermal insulation materials are widely used at present. The application principle of energy storage wallboard is to adjust the indoor temperature by absorbing and releasing heat, so as to keep the indoor temperature environment comfortable, thereby reducing the use frequency of air conditioners and achieving the purpose of energy saving. The second is to use energy storage mortar. Ordinary mortar does not have the ability to store heat, but if phase change materials are added in the mortar configuration process, energy storage mortar can be obtained. If paraffin is sealed into energy particles and then mixed with cement, a new type of paraffin mortar can be obtained, which can be applied to the indoor wall of buildings. When the indoor temperature exceeds a certain temperature (22 °C), paraffin will melt and absorb heat in the melting process, reducing the in-

door temperature of buildings; When the indoor temperature is too low, paraffin will release heat due to solidification, which will promote the indoor temperature to rise.

5. Conclusion

To sum up, for the external wall insulation of new buildings, there are significant differences in the actual effects of using different materials and matters needing attention. In practical application, both construction personnel and architectural designers need to start from their own work experience and refer to the local climatic conditions, building uses, construction location and other basic conditions to determine the functional requirements of thermal insulation materials and select the corresponding materials. On this basis, people engaged in building materials research need to invest more in innovative research, deepen the existing production methods and performance enhancement methods of environmental protection materials as much as possible, and continuously improve the energy-saving effect in the field of building materials, so that buildings can make better contributions to society.

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