Research and analysis on the development status and prospect of green building materials and green buildings in the new century

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Abstract. Most buildings always cause a lot of material waste in the construction process, and adverse impact on the environment, if these resources of the construction can be converted into environmental degradable, recyclable, low-cost, long life materials, can effectively reduce consumption, to achieve the purpose of cost savings. The concept of "green building" is a direct reflection of this concept. It advocates that construction projects must save resources as much as possible and live in harmony with nature. In terms of the current development situation at home and abroad, Japan, the United States and Western Europe and other developed countries have invested a lot of research and development in green building materials, and green building has become the main mode of building energy saving and consumption reduction. Therefore, this paper will mainly discuss the development status and prospects of green building materials and green buildings in China, Japan and the United States.

1. Introduction
In the 1960s, American architect Paul soleri first put forward the new concept of ecological architecture. Since then, green architecture began to leap into people's vision. Green building refers to the building that saves resources (energy, land, water and material), protects the environment and reduces pollution to the greatest extent in the whole life cycle of the building, provides healthy, applicable and efficient use space for people, and lives in harmony with nature[1]. Academician Wu Liangyong defined the scope of human settlement environment science as global, regional, city, community and architecture in his book Introduction to Sciences of Human Settlements[2]. Green building as one of five levels of human settlement environment science, is the most basic component unit in the city, and promote the development of urban green has the vital significance. In terms of the current development situation at home and abroad, Japan, the United States, Western Europe and other developed countries have invested a lot of research and development in green building materials. China's green building has also started a rapid development stage after entering this century.

2. Green building materials
2.1. Characteristics of green building materials
(1) Save energy: Green building materials use a lot of wastes generated in the process of urban life and industrial production as raw materials, which greatly reducing the use of natural resources.
(2) Environmental protection: Green material on the basis of meet the basic performance of...
building materials, adopt scientific methods of production and clean production technology, reducing the waste emissions, greatly reducing the environmental pollution and ecological destruction.

(3) Livable and comfortable: Green building materials do not produce toxic and harmful substances, and have antibacterial, anti-mildew, demagnetization, anti-radiation, anti-static and other functions, greatly improving the quality of life.

(4) Recycling: Green building materials can make good use of the waste residue, waste water and waste material produced in its own production process to recycle and reuse the wastes.

2.2. New green building materials -- Take Japan
In the CASBEE certification orientation and "GTAHEEP leader" system promotion, the green technology and high energy efficiency products developed and applied in Japan mainly include the following aspects[^3]:

(1) Air purification materials
The "Air purification material" being developed and applied in Japan is a revolution in the purification materials. It is a purification stone material made of zeolite and iron porous. It can purify air, deodorize and absorb moisture.

(2) Antibacterial and self cleaning glass
It adopts an existing glass treatment technology, mainly including magnetron sputtering method or sol-gel method, covering the glass surface with a layer of titanium dioxide film. It can eliminate indoor stink, smoke and body odors effectively when used in office building.

(3) DPAHC building materials
It uses photocatalyst technology. In ceramic tile surface made a film that has antibacterial action, this kind of film can restrain the reproduction of infection miscellaneous bacterium effectively, prevent mildew happening.

(4) Adjustable humidity building materials
The new product is made from Diatomite of amorphous opal mined in Hokkaido. Because it is porous, that can absorb and release moisture from the air. In temperature 20°C, 80% humidity environment, the humidity in the room with the wall tile can be held at 60%.

(5) Novel carbon fiber concrete
This kind of cement can store the heat of the sun's rays in the daytime, and then slowly release the heat at night, so it is a kind of new material for building solar houses, and it is used in all kinds of green building projects.

3. Green building

3.1. The development of green building at home and abroad
Western industrialized countries have always attached great importance to the application and development of green building materials. Up to now, the world's green building materials and green building technology works in many countries become a classic. Such as, the Siemens crystal building in London, the pixel architecture in Melbourne, and the britt center in Seattle. They all uphold the concept of green, energy-saving and clean design and construction, leading the green development of the construction industry. After entering this century, China's green building also began a rapid development stage. However, compared with western developed countries, China's building materials industry still has a series of problems of high energy consumption, high pollution, low circulation and low efficiency, etc. In 2013, the state council promulgated the "green action plan", focusing on establishing and improving the green building evaluation system. The comprehensive work plan for energy conservation and emission reduction in the 13th five-year plan clearly proposes to strengthen building energy conservation[^4].

3.2. Typical technology of green building -- Take America
(1) Natural Lighting Technologies
Natural lighting as a light source is an important design strategy in today's buildings. It can reduce the application of lighting system and play an important role in reducing energy use.

(2) High efficiency energy saving lamp and energy saving control measures
Lighting energy-saving lamp has the dual effect of saving energy and relieving peak electricity consumption.

(3) Roof greening
Besides the ecological and landscape effects of general greening, roof greening can effectively prevent the increase of roof temperature.

(4) The use of solar energy
The combination of solar energy and building is one of the most important fields in the future building energy conservation application.

(5) Water resources recycling
Green buildings in the United States generally adopt efficient water-saving equipment, and advocate the application of water recycling, rainwater and wastewater treatment.

3.3. The present situation of green building in China
(1) Lack of green building awareness
There may be errors in the understanding of green building, thinking that green building only means literally planting greening on the outside and around the building.

(2) The relevant system is unsound
China has a vast territory, from south to north, from west to east, with different climatic conditions, economic development, folk culture and so on, which resulting in a large gap in the development of green buildings in various regions.

(3) Green building technology is immature
At present, most green building designers lack perfect theoretical knowledge and practical experience on green building.

4. The prospect of green building
(1) Development prospect one: Performance visualization
When we turn on the mobile phone, we can see the energy saving, water saving, rainwater utilization, air quality and so on. Research shows that the visibility of energy saving and water saving can increase the saving rate by more than 15%.

(2) Development prospect two: Internet + green building
Through the Internet, designers can easily find a variety of new materials, new processes and new technologies that meet local climate conditions or national standards. These new materials can be rapidly applied to buildings through the Internet.

(3) In addition, such as internet-based design, internet-based construction, internet-based operation sign management, these are also the inevitable direction of green building development in the future.

5. Conclusion
The promotion and application of green building materials and green buildings is an inevitable trend in the new century. The development of green buildings has far-reaching significance for economic development, environmental improvement and human health. This paper briefly analyzes the development of green building materials and green buildings in China, the United States and Japan. And explain the existing problems at the present stage of our country. Finally, this paper combined with the current situation and the latest technology, both at home and abroad about the future prospects of the development of green building and puts forward some views.

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References

[1] Evaluation standard for greening building[S]. GB/T50378-2006.

[2] Wu, L.Y. (2001) Introduction to Sciences of Human Settlements. China Building Industry Press, Beijing.

[3] Wang, Z.L., ITOH Motohige, Shuichi Yoshida, Shangyuan Tianchuan. (2016) The development trend of green building industrialization in Japan(middle)[J]. Residence and real estate, 14: 70-74.

[4] The state council. “the 13th five-year plan” Comprehensive work plan for energy conservation and emission reduction[J]. China building materials, 2017(3): 10.

[5] Yang, X.M., Zhao, H., Chen, J., Yao, Q. American policy on green building, technical analysis and thinking[J]. Building Energy Efficiency, 2012, 40(12): 17-20.

[6] Lv, J. Research on the development status and trend of green buildings under the concept of low carbon[J]. Jiangsu science and technology information, 2018, 35(24): 75-77.

[7] Meng, N. Current situation and prospect of green building development[J]. Architecture, 2015(08): 8-10.