Research on New Materials in Civil and Construction Engineering

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Abstract. Along with the development of industry and economy all around the world, the traditional materials have made great achievements. But traditional materials have many disadvantages such as high cost, difficult construction, etc. Besides, we have to face the following problems such as air pollution, water pollution, depletion of natural resources, etc., so new materials which have better functions will play an important role in the field of civil engineering. This article is through the introduction to new materials for civil engineering to do an overview.

1. Introduction
New material industry has penetrated into all fields of national economy, national defence construction and social life. It plays an important role in the development of national economy. The main developed countries attach great importance to the investment and development of new materials industry. With the development of our country, people start to pay more and more attention to the living environment. The state also put priority on the development of new functional materials, advanced structural materials and composite materials. Civil engineering construction is such an important part of national development, so the new materials in this field have broad prospects.

2. The Definition of New Materials
New materials are referred to materials that have excellent performance and special features which traditional materials do not have newly emerging or developing. In addition, the traditional materials whose performance have been significantly improved or have produced new features also belong to the new material. It is generally believed that some key materials to meet the needs of the development of high-tech industries are also the category of new materials. New materials have been widely used in various industries. As the basic and pillar strategic industry, new materials are the foundation and the forerunner of modern high technology and industry.

3. Thermal Insulation and Energy Saving Materials

3.1. Foam Concrete
Foam coagulation is transferring the vesicant into full foam by mechanical means through the foaming system of foaming machine and uniform mixing the foam and cement slurry. Then the pumping system of the foaming machine is used to carry out the pouring construction or the mold forming, and a new type of lightweight thermal insulation material which contains a large number of closed pores formed after the natural curing. Foamed concrete is a new kind of building energy-saving materials which is waste re-cycled, environmental friendly, energy saving, low-cost and non-burning. As a new...
type of energy-saving and environmental protection building materials, domestic and foreign scholars have done a lot of research, so that it is widely used in wall materials. The advantages are: small density, light weight, heat preservation, sound insulation, earthquake resistance and other properties. But it also has some shortcomings, such as low strength, cracking, water absorption and so on. So it is necessary to do further re-search on foaming agent, mix ratio, process flow and equipment to extend its application field.

3.2. Estazolam Plate
Estazolam plate is a new type of wall material which can be used to replace the brick for load-bearing walls, non-bearing walls, floor, balcony, etc. It has many advantages such as expanding the use area of buildings (10%-15%), heat insulation, sound insulation, seismic resistance, waterproof, construction simple, etc. At the same time, greatly reduce the cost of the project. It is made of cold drawn low carbon steel wire which is welded together that has the characteristics of strong joints, reasonable structure, uniform mesh, etc. It is a kind of special mesh used in the construction of floor heating.

3.3. Autoclaved Aerated Concrete
The concept of aerated concrete is light porous silicate product with calcareous and siliceous materials as the main raw material and foaming agent (aluminium) as adulterating agent. The technological process includes batching, mixing, pouring, pre raising, cutting, autoclaving, maintenance, etc. It contains a large number of uniform and small pores. The performance advantages are: light weight, fire proofing, sound insulation, heat preservation, anti-seepage, an-ti-seismic, green, lasting long, etc. Because of these advantages, it is commonly used in high storey frame architecture, seismic area building, building in icy cold area, soft ground construction, etc. Aerated concrete production is rich in raw materials, especially the use of fly ash as raw materials which has two good effects. First it is good for the integrated utilization of the industrial residue, control of the environmental pollution, protect of the arable land. Second it also can create a good social benefit and economic benefit. Aerated concrete is one kind of ideal wall material to replace the traditional solid clay brick which is strongly supported by the nation-al wall reform policy, tax policy and the environmental protection policy over the years. It has broad marketing space and developing prospect. The title is set 17 point Times Bold, flush left, unjustified. The first letter of the title should be capitalized with the rest in lower case. It should not be indented. Leave 28 mm of space above the title and 10 mm after the title.

4. Roofing Energy Saving Materials

4.1. Vermiculite and Vermiculite Brick
Vermiculite is a natural non-toxic mineral which expands under high temperature. It is a relatively rare mineral and belongs to the silicate. The use of expanded vermiculite is very extensive, but it is mainly used as building material. According to the American consumption structure in 1986, expansion vermiculite accounted for 52% among all the materials used as mortar and cement pre mixture and light-weight aggregate concrete. In Britain expansion vermiculite accounted for 40% among all the different materials used as concrete, mud painted on the wall and cement coagu lant .It is applied in many different fields, including building, forestry, metallurgy, etc.

Vermiculite brick is one kind of heat insulation products with regular shape. Vermiculite is the raw materials added with binder. There are vermiculite cement products, asphalt vermiculite products, etc. The density of vermiculite brick is 0.4~0.5g/cm3, room temperature thermal conductivity is 293 to 502.4 J/ (m·h·°C) (70~120cal/ (m·h·°C), compressive strength is under 0.5MPa and water absorption rate is around 6%. Vermiculite brick belongs to the thin-wall hollow structure products. The strength and the melting point are low. The refractoriness and high temperature properties were lower than other light-weight refractory materials. It should not be used for load-bearing parts and should not be used as high temperature heat insulation material; the temperature it can withstand is 800 to 900°C. Vermiculite brick is widely used in roof treatment, noise protection, etc.
4.2. Polystyrene Foam Board
Polystyrene foam board -- also known as EPS foam board, EPS board is white object composed of expandable polystyrene beads containing volatile liquid foaming agent which is heated and formed in the mold after preheating. Its structure feature is the subtle obturator.

EPS foam board has a lot of advantages including heat preservation, sound-absorbing, self-extinguishing, antiaging, etc. So it is mainly used for building wall, roof insulation, composite board insulation, cold storage, air conditioning, floor heating, decorative carving, etc.

5. Steel Architecture Materials
Polyurethane board is made of PU, or polyurethane sandwich panel formed by PU and color steel plate. It is wildly used in energy saving industrial plants, civil construction, dwelling house, etc.

The characteristics are: good fire resistance, non-toxic and tasteless, waterproof, moisture proof, low thermal conductivity, good thermal insulation performance, etc. So it is a kind of widely used high efficiency energy-saving building envelope material. It has great potential and a new type of energy saving plate which is advocated and promoted by the national Ministry of Construction.

6. Summary
New materials for civil engineering occupy an important position for the use of resources and the environmental impact. The output, energy consumption, environmental protection and other aspects are big part of the national economy. New materials have the features of multi-function and high performance, to be specific, light weight, high strength, good technology and excellent durability. All of these features can meet the needs of social development and make people have a more comfortable living environment. At present, the national policy guidance on development of new materials is a huge opportunity.

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