



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 8, August 2024

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.524

9940 572 462

6381 907 438

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# **Study on Properties of Aerated Steam Curing Concrete Materials**

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**ABSTRACT:** With the improvement of environmental requirements of globalization, more and more attention has been paid to energy conservation and emission reduction and ecological protection. In view of the excellent performance of gas-steaming concrete in energy saving, material saving and industrial solid waste utilization, gas-steaming concrete has received the attention of researchers. With its advantages of light weight, high strength, heat insulation, thermal insulation and environmental protection, the gas-filled steam concrete has been widely promoted and applied in green buildings. This paper summarizes the green characteristics of aerated steaming concrete, and discusses the development prospect of its application.

**KEYWORDS:** Gas filling and Steam raising concrete, Green environmental protection, Building materials.

## **I. INTRODUCTION**

The concrete contains a large number of closed small pores, with excellent thermal insulation, sound insulation and fire resistance and seismic performance[1], is very suitable for building partition or filling materials, is a new type of green building materials, in recent years has been used in a large number of light non-structural components or semi-structural components in[2]. With the rapid development of urbanization and the construction industry, and the concept of green architecture, with the development of prefabricated buildings, the application of precast partition walls poured with gas steam and steam concrete will be more and more widely used, and the market demand will continue to increase. And the structure and decoration of prefabricated foam concrete wall board factory one-time production, no need to set up another insulation layer, less construction waste, reduce pollution, installation safe and fast, improve work efficiency, reduce construction cost. Therefore, the economy and advantages of foam concrete in the prefabricated construction as the wall panels are very prominent, which is also the practical significance of the topic selection of this paper.

Paper is organized as follows. Section II describes automatic text detection using morphological operations, connected component analysis and set of selection or rejection criteria. The flow diagram represents the step of the algorithm. After detection of text, how text region is filled using an Inpainting technique that is given in Section III. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

## **II. EXCELLENT PERFORMANCE OF AERATED AND STEAMED CONCRETE**

### **2.1 Light**

Aerated steaming concrete products generally use autoclaved curing[3]. The expansion agent of aerated steaming concrete is aluminum powder. In alkaline environment, the reaction of aluminum powder and calcium hydroxide will form small bubbles, and finally a large number of bubbles are evenly distributed in the slurry, which will increase the volume of the slurry. The formation of high porosity, lightweight aerated steam concrete. Because of its low density, good seismic performance and other excellent characteristics, it can effectively reduce the building dead load, reduce the foundation size and construction cost, which is conducive to saving energy and reducing labor cost. The literature[4] even expounds the possibility of aerated steam concrete being used in structural components.

### **2.2 Sound absorption is good**

Because of its microporous structure, the gas-filled steam concrete has the advantages of light weight, high strength, thermal insulation, fire prevention and waterproof, low thermal conductivity and good sound insulation and sound absorption performance. Aerated concrete is a material with porosity of more than 80%. Its strength, permeability,

diffusion, shrinkage and creep properties are closely related to porosity and pore size distribution. pore structure characteristics have an important influence on the performance of aerated concrete[5]. The concrete has high porosity and has excellent sound absorption effect in the building. Relevant researchers will be surface untreated and after drilling, saw joint processing aerated steam concrete, under different incident sound frequency, the measurement results show that the sound absorption capacity of untreated steam concrete and other porous sound absorption materials, such as foam glass, foam plastic, sound absorption coefficient is small, but than brick wall, gypsum board, terrazzo, concrete wall board sound absorption coefficient is big, especially under the high frequency sound absorption effect is good. After drilling and saw joint processing, the sound absorption effect of the aerated steam concrete has been significantly improved, so the aerated steam concrete can be made into sound absorption materials for some buildings and parts with low sound absorption requirements to use[6]. For example, the generator room of the power plant uses aerated and steamed concrete drilling sound absorbing board, the film studio and the return air muffler of the recording studio uses aerated and raised concrete block to have obtained good results, so we reasonable use of aerated and steamed concrete can improve the sound absorbing effect of the building.

The work in this paper is divided in two stages. 1) Text- Detection 2) Inpainting. Text detection is done by applying morphological open-close and close-open filters and combines the images. Thereafter, gradient is applied to detect the edges followed by thresholding and morphological dilation, erosion operation. Then, connected component labelling is performed to label each object separately. Finally, the set of selection criteria is applied to filter out non text regions. After text detection, text inpainting is accomplished by using exemplar based Inpainting algorithm.

### **III. ENVIRONMENTAL PROTECTION**

#### **3.1 The energy consumption of aerated steam concrete is less**

Steam concrete is a collection of light, thermal resistance, energy saving and other advantages in one, building energy saving of 50% of the single wall material[7]. This is due to the energy consumption in the production process of sintering expansion agent, and the energy consumption cost is relatively low compared with ordinary concrete. At the same time, the production process of aerated steam concrete is highly automated and mass production, which greatly improves the production efficiency. In the production process, the effective use of resources can also be realized. For example, the solid waste generated in the production process can be reused, reducing the emission of waste materials. Moreover, compared with ordinary concrete, the raw material cost of gas steaming concrete is relatively low. Therefore, the pollution generated in the process of manufacturing, transportation and use is relatively small, which is an environmentally friendly building material.

#### **3.2 Rational utilization of industrial solid waste**

Aerated steam concrete can use all kinds of industrial waste, such as fly ash, tailings, coal gangue, waste gypsum, the waste after certain processing, can be used as gas steam concrete raw material, so as to realize waste, realize the reuse of waste resources, reduce the impact on the environment of waste resources, can achieve the purpose of saving energy and protect the environment, meet the requirements of the circular economy of green materials. At present, China's copper tailings are basically in the state of tailings pond stacking. According to relevant estimates, from 1949 to 2007, the emissions of copper tailings in China were roughly 2.4 billion[8]. Related researchers research with copper tailings preparation without lime LPG steam concrete, the use of solid waste and reduce the calcined lime of CO<sub>2</sub> emissions, using a copper tailings slag a wind sand a cement raw material system, high silicon content of wind sand to supplement the silicon components in the raw materials, make the autoclaved gas steam concrete generate more today to rock crystal. In addition, the copper tailings and slag with high calcium and magnesium content are used to replace the lime components in the traditional aerated steam concrete, to achieve the purpose of reducing the emission of CO<sub>2</sub>[9]. The preparation of aerated concrete with copper tailings was successfully studied, which expanded the selection of raw materials of aerated concrete and provided a new way to deal with copper tailings.

### **IV. TECHNOLOGY CONTINUES TO DEVELOP**

#### **4.1 National policy support**

We will focus on building a beautiful China, accelerate comprehensive green transformation in economic and social development, improve the ecological and environmental governance system, give priority to ecology, economical, intensive, green and low-carbon development, and promote harmonious coexistence between man and nature. Green

and safe buildings and green development in urban and rural areas are the current important issues of global sustainable development. In this context, as a green material, the production and use of aerated and steamed concrete will not cause any pollution to the environment, which will provide strong policy support for the development of aerated and steamed concrete.

#### 4.2 Excellent material properties

Aerated steam concrete has high efficiency performance, can achieve rapid hardening, heat insulation and other functions. At the same time, its production process is relatively simple, it can be large-scale production, so it has a wide application in the construction, bridge and other fields.

#### 4.3 Satisfy the needs of; meet the needs of

With the continuous improvement of people's requirements for building comfort and aesthetics, the gas-filled steaming concrete is also gradually developing towards the direction of humanization and personalized design. For example, different looks and textures can be achieved through different ingredients and processes to meet different design needs. At the same time, the aerated steam concrete can also achieve good sound insulation and heat insulation performance through reasonable structural design and material selection, and improve the quality of living and working environment.

#### 4.4 Technology continues to develop

The technology of aerated steaming concrete has been continuously studied, and a lot of achievements have been made, and the performance of aerated steaming concrete is also constantly improved. Concrete is widely used in various construction fields, such as residential buildings, office buildings, Bridges, tunnels, airports and so on. It can not only be used as the main building material, but also can be used to make thermal insulation wall, sound insulation board and thermal insulation materials. At the same time, aerated steam concrete gradually plays a role in other fields, such as aerospace, military, automobile, etc. In addition, it can be used in pipelines and storage tanks. With the increasing market demand, the application prospect of aerated steam concrete will be further expanded.

To sum up, the gas steam and steam concrete block has many advantages, in line with the national industrial policy, is the national key promotion of high-tech projects, broad market prospects, strong product competitiveness, using waste residue, waste into treasure, energy saving, has high economic, social and environmental benefits. It has broad development prospects. With the continuous progress of technology and the continuous change of social needs, the aerated steam concrete will continue to develop and improve, providing more possible options for the future construction market.

## V. TECHNOLOGY SEVERAL CONCRETE NEED TO BE STUDIED IN DEPTH

#### 5.1 Expansion of microcracks

The cracking of autoclaved concrete wall has been the concern of engineers and technicians, and has also become the main reason hindering the promotion of autoclaved concrete. The main feature of autoclaved aerated concrete is porous, and the lack of systematic and in-depth research on the hole structure of autoclaved aerated concrete hinders the improvement of its performance control level and engineering quality[10]. Crack is one of the most easy defects in aerated steam concrete, the main causes include the external environment and the shrinkage of concrete itself. How to solve this problem so as to improve the application scope of aerated steam concrete is an important research direction.

#### 5.2 Low surface flatness

The cause of the rough surface of aerated steam concrete is mainly caused by calcium carbonate precipitation in the hardening process. Measures to improve surface roughness include the selection of high strength, corrosion resistant materials, cleaning surfaces and the use of surface treatment techniques.

#### 5.3 Poor durability

The main reason for the poor durability is the erosion of chloride ion and other harmful substances in the aerated steam concrete, the porosity of the aerated steam concrete is high, the liquid and gas are easy to penetrate, but also lead to its easy to be eroded[11]. More effective protection measures are developed to improve the performance of the steaming concrete, solve the engineering problems, and promote the development of the steaming steaming concrete.

#### 5.4 Secondary utilization of solid waste

At present, some technologies can process some solid waste into aerated-steaming concrete through technology, expand the application of all kinds of solid waste in aerated-steaming concrete as raw materials and the difference in the performance of aerated-steaming concrete produced with different solid wastes and different processes.

Above is the possible problems in the process of aerated concrete production, need through technology sustainable development, using a series of effective measures to prevent and improve, in the actual production and use process, should be according to the specific situation to choose the appropriate measures, in order to improve the performance of aerated concrete and prolong its service life. At the same time, strengthening production management and quality control is also an important measure to prevent the defects of the steam concrete.

### VI. CONCLUSION

This paper summarizes the related research of aerated steaming concrete and analyzes the advantages and disadvantages of aerated concrete materials. In terms of theoretical research, the mechanical properties, thermal conduction properties and durability of aerated steamed concrete are deeply studied through experimental and numerical simulation methods. In terms of experimental research, the material characteristics, microstructure and formation mechanism of aerated steam concrete are analyzed through experiments. At the same time, the environmental friendliness and sustainability are discussed, and its application prospect in green building is analyzed. With the rapid development of the construction industry and people's attention to building environmental protection and energy saving, the demand for gas filling and steam concrete is increasing, and its application field will be further expanded. As a green building material with wide application prospects, aerated steaming concrete will play an increasingly important role in the future construction field. With the continuous innovation and progress of technology, the performance and application scope of aerated and steamed concrete will be further expanded and improved.

### ACKNOWLEDGEMENTS

This study was financially supported by the General Project of Hunan Provincial Education Department (grant no. 2023C0339).

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