Modeling and of Diatom Mud in Residential Space and the Application Scenario Research

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Abstract

Our original ecological diatom mud qualities as a starting point for research, analyzes people's consumption concept, aesthetics, environmental protection awareness. This article describes the basics and the origin of diatom mud, diatom mud analyzes the features, functions and defects, the diatom mud paint and wallpaper were compared to explain the process and the market situation diatom mud, silicon Prospects algae mud were discussed. Through analysis of this environmentally friendly decorative paint diatom mud, summed diatom mud there are some problems in the conventional construction; through research and exploration of the diatom mud module series is proposed in the form of modules forming diatom mud can serialization assembly decorative product design concept.

Keywords: diatom mud, living environment, living space, modeling, application.

Introduction

In recent years, the impact of interior decoration materials on air quality is being noticed. In addition to aesthetic and practical decorative effect, environmental health functions become an important selection of decorative materials reference index and energy saving, healthy and comfortable interior decoration materials products gradually become the main tendency of the building materials industry. Diatom mud decorative wall material of the unique features of multiple environmental health to become the new darling of decorative building materials market, a unique decorative effect has gained more and more users of all ages.

Paints and coatings include diatoms diatom mud. Diatoms paint is added to a conventional latex or oil paint in a certain percentage of diatomaceous earth to impart regulate humidity, absorption of harmful gases to improve adhesion and abrasion resistance more features and so on. Diatom mud is diatomaceous earth as the main raw material, adding a variety of additives made of powder coatings. Diatom mud is China in recent years, emerging as a functional interior decoration environmentally friendly materials, with humidity control, air purification, fire retardant, acoustic noise reduction, thermal insulation and protection of eyesight, self-cleaning walls and other features. Diatom mud is not only versatile, but also can make a

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variety of color texture, rich styling, style, complete, so the diatom mud introduced into China just a few years it has developed rapidly, the majority of customers and recognition.

Diatom mud is a new natural green paint, latex paint and wallpaper to substitute for villas, hotels, homes, apartments, hospitals and other interior decoration. Since the water resistance is poor, not much current is applied to the external walls. Diatomaceous earth from fossil marine diatom algae plants formed after millions of years, the main component of opal and its variants, followed by clay minerals.

Diatomite prominent molecular lattice structure determines its unique features, it has a strong physical adsorption and ion exchange properties, after finishing widely used functional coatings, pharmaceutical aid, food additives, nuclear radiation adsorbents and other fields. Diatomaceous earth is a siliceous sedimentary rock, mainly in China, the US, Denmark, France, the former Soviet Union, Romania and other countries.

![Diatomite SEM photograph.](image)

**Figure 1. Diatomite SEM photograph.**

**The Proposed Methodology**

**Diatom mud decorative wall material.** Diatom mud is mainly composed of inorganic cementitious materials, diatom functional fillers, pigments and other auxiliary materials. Currently diatom mud wall decoration materials market mainly dry powder coating material was stirred when such products into similar construction of water sludge, referred to as "diatom mud." and more to scratch, wiping construction methods, mainly by its functional features added fillers decision.

**Diatomite features.** The main function of the material as diatomaceous earth is a biogenic siliceous sedimentary rock, the ocean or lake grown diatoms creatures underwater debris deposited by a non-metallic mineral natural environment and evolving role.
The main component of diatomaceous earth is amorphous SiO$_2$, followed by minerals, but also contains some organic matter. SiO$_2$ content is one of the diatoms content measurement flag diatomite ore.

Diatomaceous earth because of its unique structural features and a delicate, loose, light, porous, absorbent and strong penetration properties and diatomaceous earth and the physical characteristics of both the chemical composition, but also with algae are composed of mineralization environmental conditions and directly affect the diatomite applications. These properties include the color, physical properties, specific gravity, bulk density, melting point, particle size, pore size, and some applications also need to consider the specific surface area and porosity.

Since diatomite unique porous structure and excellent absorption properties, making diatom mud decorative wall material combines the unique features of environmental health.

**It features diatom mud decorative wall material.** Diatom mud decorative wall material is the use of diatomaceous earth having a delicate, loose, light, porous, absorbent and permeability and other characteristics, with the traditional interior decoration materials combined to produce both decorative effect and environmental health function decorative building materials. Diatom mud has the following characteristics.

The humidity performance. After the film-forming diatom mud coating the interior has a porous structure, when the indoor air relative humidity is too high, the air vapor pressure above the saturation vapor pressure of diatoms wall material surface hole concave surface water on this when water vapor is adsorbed, the desorption and vice. By water vapor absorption, release, effectively regulate the indoor air relative humidity values, so that control in the appropriate range of human health, improve indoor air quality, good living environment.

Purifying air. Purification function is also porous channel structure is based on the adsorption of free capture odor molecules in the air, formaldehyde, benzene, volatile organic compounds and a variety of substances. Add the appropriate preparation process purification materials, odor molecules adsorbed molecules rapid decomposition of harmful substances, and thus achieve the purpose of purifying the elimination of hazardous substances, keep indoor air fresh and clean. Diatom mud has a unique "molecular sieves" structure, not only can absorb moisture in the air can be effectively adsorbed in the air free of formaldehyde, benzene and other harmful chemical substances and odors from smoking, garbage, pet excretion produced thereby to purify indoor air purposes. This is similar to the physical adsorption of activated carbon, but also has the effect of chemical decomposition. Physical adsorption diatom mud is a quick process, but a slow chemical decomposition. Specific reaction process is as follows:
2HCHO + O2 = 2HCOOH

2HCOOH + O2 = 2CO2 ↑ + 2H2O

C O2 + H2O + Ca2+ = CaCO3 ↓ + 2H+ + 

2HCOOH + Ca2+ = Ca(HCOO)2 + 2H+ + 

Ca(HCOO)2 + O2 = CaCO3 ↓ + H2O + CO2 ↑

Anti-condensation. Indoor relative humidity stays high, the construction of the wall is easy to produce condensation, having a high level of humidity performance diatom mud decorative wall material can be efficiently adsorbed water vapor molecules and water molecules inside a high capacity reservoir to remove the accumulated surface excessive water vapor molecules to prevent surface condensation.

Antibacterial and anti-fungal. Diatom mud decorative wall material can effectively absorb water vapor adhering to the surface, eliminating mold, bacteria growth environment from the source, in addition to effectively suppress and destroy the growth of mold. Some diatom mud products tend to add a certain amount of antimicrobial agent, in order to achieve efficient antibacterial effect sterilization.

Protect eyesight. Diatom mud porous surface, which will help generate diffuse, effectively reduce the refractive index of the light, so soft colors. Diatom mud coating the room, the walls reflects light naturally soft, not easy to cause visual fatigue, can effectively protect the eyesight, especially for the protection of eyesight effect is remarkable. The paint surface is flat as a mirror, tend to have higher gloss, refractive index of light is strong, so sharp colors, easily lead to visual fatigue, damage eyesight.

Acoustic noise reduction. Diatom mud itself porous, with strong noise reduction function, can effectively absorb harmful high frequency sound segments, and low frequency noise attenuation. Its effectiveness is equivalent to the same thickness of the stone or cement mortar 2 to 3 times. At the same time can be reduced nearly 50% of the reverberation time, significantly reduce the noise on the human body, it is also more suitable for diatom mud railway station and residents near the plant and the use of mechanical units, diatom mud will create a restful night's sleep or working environment.

Self-cleaning walls. Diatom mud is mainly composed of an inorganic material SiO2, does not produce static electricity, dust easily attached to the surface. Even among texture or pattern fall into the dust, it is very easy to remove with a feather duster, for hand writing footprints and can be erased with a rubber lightly, as the new permanent wall.

Design animated image. In the early development of China's animation industry, folk art is widely applied to the design of the animated image, and achieved good results. Folk art in China has a very long history, from the Dunhuang murals to the Han Dynasty brick, paper cutting from
northern Shaanxi to Tianjin clay figurines, paintings from Weifang to Shengzhou Shaoxing opera, are forms of folk art. In addition, the design of the characters also has a very rich experience, these design experience and skills for animated image designs, has a very good reference guide, which is the most typical drama. Theatre is one of the widely popular folk art forms of folk art in terms compared to other, more emphasis on characters design, which is the most typical mask and clothing.

**Building materials and technical requirements.** Diatom mud technical characteristics of the product, this standard provides technical requirements diatom mud decorative wall material includes a total of three parts, namely, the general technical requirements, functional requirements and technical requirements of harmful substances.

General technical requirements which include nine state indicators, workability, appearance of the coating, the initial drying crack resistance, dry time, alkali resistance, adhesive strength, resistance to temperature and humidity performance and diatoms and other ingredients; functional technical requirements include The humidity performance, formaldehyde adsorption properties, formaldehyde purifying effect lasting performance, anti-fungal and anti-5 performance indicators mold durability, etc.; harmful substances required to detect volatile organic compounds, benzene, toluene, ethylbenzene, xylene sum of free formaldehyde and soluble heavy metals.

**Application Status diatom mud.** Diatom mud as a new type of environmentally friendly materials, in the form of mud is replacing wallpaper, paint and other traditional interior decoration materials, its production and use have great prospects for development.

Japan long ago diatom mud has been used in the construction industry. In the 1960s, Japanese scholars began to conduct functional studies diatom mud, diatom mud soon as a new functional building material is widely used. In 1980, the study of environmentally friendly building materials concern environmental protection experts, diatom mud function once again scientists deepen the study, after selection and processing of mineral products diatoms used as a filter aid and adsorbent materials, used in food many areas of medicine, daily chemical, nuclear waste and sewage treatment, such as the production of beer filtration, water purification, medical injections and blood plasma filtration, beauty care products manufacturing and so on.

**Test methods and index.** According to various architectural coatings, interior paint test method specified in the standard functions of the technical indicators at home and abroad, combined with interior decoration diatom mud wall material characteristics Technical indicators refer to the existing domestic and international testing methods and standards, finalized the present standard of the technical requirements and test methods.

**Diatoms ingredients.** Diatom mud decorative wall material reason why the name diatom mud, diatom is because it must function as the main material, and thus comprise one diatom diatom mud decorative wall material must have the basic characteristics.
Different manufacturers diatom mud formulations on the market vary, many of the components added to the quantitative analysis of the product a great deal of difficulty. The most commonly used quantitative analysis of diatom test methods are X-ray diffraction (XRD) phase analysis and chemical methods, when used diatom mud product analysis, testing error caused due to complex composition bigger.

Several of the above quantitative analysis of the working group have carried out a large number of tests, not to draw reliable conclusions.

**Temperature and humidity resistance properties.** Multi-cellular structures exist diatom mud coating, in the course of ongoing moisture absorption, desorption cycles, while the ambient temperature changes will also affect the pore structure, and thus have an impact on the life of the coating. Objective setting temperature and humidity-resistant performance is to investigate the diatom mud products subject to temperature and relative humidity after many changes, which affect performance and service life.

**Functional technical requirements.** Diatom mud decorative wall material diatoms as the main functional materials, and therefore has specific properties, such as good moisture absorption and put wet, formaldehyde adsorption properties. Because diatom mud decorative wall material having a strong adsorption, water vapor is a good carrier, bacterial and mold growth is moisture conditions. In order to avoid long-term use of the product in question is easy to mildew, diatom mud wall material goods should be reduced by the addition of anti-bacterial mold mildew case material, so this performance standard in mold and mildew can be performed as a function durability index provisions.

Diatom mud wall material has a good adsorption, not only on the ability of the adsorption of water vapor in the air, the smell in the air molecules has the same absorption features. This standard is currently selected in the home are more concerned about formaldehyde gas as a representative diatom mud adsorption capacity to detect harmful gas molecules.

If only pure diatom mud after adsorption of formaldehyde molecules over time to reach saturation adsorption, adsorption of formaldehyde molecules could be desorbed overflow again cause harm to human health. Therefore, diatom mud wall material as an environmental health product requires a certain degree of purification, purification by adding functional materials, etc. to achieve in this standard indicators added formaldehyde purifying effect durability requirements.

Diatom mud decorative wall material used in wet environments due to the coating process a large number of pores of the adsorption of water vapor, so easy to produce mold. As an environmentally healthy building materials and mold is necessary to achieve targets.
Conclusion
Diatom mud decorative wall material can effectively improve indoor air quality, beneficial to human health, with the introduction of industry standards, consumer awareness of products continues to increase, in order to regulate the market, it would also promote the healthy and orderly Rapid development. Compared to the traditional method of indoor air purification, air purification and diatom mud decorative material combination, with no energy, no secondary pollution, permanent purification, etc. and it is extremely suitable for hotels, guesthouses and the elderly, children and pets family.

References