

Research and Application of Shell Powder

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Abstract. China shell output accounts for more than half of the world's total shell output, there are a large number of abandoned shells on the beach, the coast of China, shells calcium carbonate content of about 95 %, has great application value. At present, it is mainly used in sterilization, heavy metal adsorption, calcium products and chemical materials.

1. Introduction

Shells are calcifications formed by some aquatic mollusks using secretions of specific gland cells in the coat membrane to protect their soft parts. It is a kind of composite material made by molluscs combining inorganic minerals and organic matter produced by them in ambient temperature and pressure. The shell is divided into three layers: the outermost layer is the stratum cornea, the middle layer is the Prismatic layer and the inner layer is the Pearl layer.

According to the statistics of the fishery Bureau of the ministry of agriculture, the annual production of shells began in the early 1970s, from around 3 00000 tons in the early 1980s to around 2 million tons in the early 1990s. Since the reform and development, shell farming industry has developed rapidly, by 2002, the total annual output exceeded 10 million tons. Since then, the shell culture industry continues to maintain high-speed development, the annual output of shells has been maintained at more than 10 million tons.

China shell production as a proportion of the world's total shellfish production basically stable at more than 50 %. The world's total production stabilized at more than 20 million tons until 2006, with the bulk of the increase in world shellfish production coming from China. The steady development of shell breeding brings about the improvement of living standard, nutrition supply and economic income, but at the same time it also causes the accumulation of a large number of derelict shells on the beach and coastal zone, which have more and more serious influence on the surrounding environment.

2. Four aspects

At present, the raw material of calcium carbonate production comes from mining, which not only consumes non-renewable mineral resources, but also damages vegetation, causing high energy consumption and high pollution. How to efficiently recycle and utilize these large amount of seafood waste becomes an important raw material for production is a hot issue. Shell powder is shell powder after high temperature claimed and crushed. Its 95% main components are calcium carbonate, chitin, and a small amount of amino acids and polysaccharides. At present, shell powder has been applied to the following four aspects.



2.1. *The first aspect- bacteriostatic*

Ran Hue et al. Claimed shell powder at high temperature. Through inhibition zone test, minimum inhibitory concentration test and bacteriostatic rate test, it was found that high temperature claimed shell powder had certain inhibitory effect on *Staphylococcus aureus* and *Escherichia coli*. The bacteriostatic mechanism is that the claiming of shell powder contains trace elements such as copper and zinc, which enhance the bacteriostatic effect [2].

Oikawa [3] compared the pressure. After calcination, a Scallop in Shell, beginning, etc. for the antibacterial activity of butterfly shell *E. clever* bacteria colony, results showed that calcination was pressure butterfly shell. It has the best antibacterial properties and can be applied to the preparation of antibacterial agents.

KuoZhao[4] et al. found that calcination temperature has a certain effect on the bacteriostatic of shell powder. The bacteriostatic of shell powder after calcination at different temperatures is stronger than that of shell powder without calcination. The total number of bacteria on culture medium of acid treatment shell powder was significantly lower than that of control. The higher the acid concentration, the higher the bacteriostatic, but the lower the bacteriostatic. The total number of bacterial colonies in culture medium were significantly lower than the control, the higher the alkali concentration increased the bacteriostatic, but then increased to 1.2 %, and the bacteriostatic decreased. Direct crushing, calcination, alkali treatment and acid treatment were used to monitor the dynamic tendency of rice surface mold spores. Acid treatment, alkali treatment, calcination and direct pulverization. Therefore, shell powder has a wide application prospect in medical and agricultural fields.

2.2. *The second aspect- adsorption*

Shells are widely used to adsorb gas and liquid impurities. Calcium carbonate minerals are widely concerned because of their high efficiency, low cost and simple operation.

Chemnitz's[5] study on adsorption of shell powder to Pb(II) in wastewater showed that the adsorption capacity of shell powder increased with the decrease of shell particle size and the adsorption of shell powder to lead(II) increased with the increase of PH. With the increase of temperature, the adsorption of adsorbent increased, indicating that the adsorption process is endothermic.

At present, stabilization is the main method for soil remediation of heavy metal pollution's recent years, some achievements have been made in the stabilization restoration of heavy metals by adding stabilizers to soil and reducing the bioavailability and migration of heavy metals through adsorption, precipitation, complication, ion exchange and oxidation reduction.

Zhuozhang et al [6]. Found that the reduction of heavy metal leaching concentration in soil after the stabilization of shell powder was effective and the migration of heavy metal was lower.

With the shell as the matrix, people have developed a new type of wall material with healthy function. Because the shell powder has unique natural porous structure, it has super strong adsorption function. Shells contain a variety of biomass elements, such as amino acids, chitin and other ingredients, which can effectively adsorb and decompose formaldehyde, TVOC and other harmful substances in the air, and reduce indoor smoke smell, pet odor and so on. Our country vigorously develops the marine economy and the marine new materials, supports the shellfish wall material industry, and its prospects and development potential are in good agreement.

For people with chemical allergies, such as asthma, hay fever, children, pregnant women and old people, it is the most suitable natural material for use. For the staff who work 8 hours a day in the office and students in school, the air quality of indoor environment determines the efficiency of work and health, and the use of shell powder biological coatings is an excellent choice for improving office and learning environment.

2.3. *The third aspect- Calcium supplementation*

Calcium is an indispensable mineral in the body, plants and animals. If the human body is short of calcium, it will lead to osteoporosis, bone hyperplasia, limb convulsions and other diseases.

If the soil or medium is calcium-deficient, some crops will have a large amount of chaff or slow growth. The main ingredient of shell powder is calcium carbonate, the content is around 95 %, also have Phosphor, manganese, zinc, iron, potassium, magnesium and other minerals, and it is a cheap calcium fertilizer.

For the lack of calcium in plants and animals, it has a very good mitigation effect.

2.4. The fourth aspect- Chemical feedstock

The shell powder not only contains a large amount of calcium carbonate, has a special layered structure and excellent toughness, but also has a natural porous surface.

Calcium carbonate crystals interlayer, very close stacking, there is organic matrix between layers, so the Pearl layer of the shell is a natural organic inorganic composite material, this special bio mineralization structure makes the shell has ordinary calcium carbonate strength and toughness.

And the main component calcium carbonate shell has a large surface area, the space is uniform, the stomata rate is high, the certain porosity ratio makes shell powder has certain adsorption to the Nano inorganic particles, is one of the most suitable carriers.

Qinxiaoyan [7] et al. made the shell powder No composite by Co-precipitation method. It was found that the shell powder had good adsorption effect. No particles with uniform particle size were adsorbed on the surface

E of the shell powder. No doped did not change the original morphology of the shell powder, but the original sharp edges of the shell powder became smooth? It is good to disperse evenly. Modified coating was made by adding composite to coating. By comparing the physical properties of pure polyuria coating and modified coating, the composite polyuria modified by shell powder No has better physical properties in tensile strength, fracture elongation, impact resistance and wear resistance.

At present, three kinds of fillings are calcium carbonate, Kaolin and talc powder. The total use of these three kinds of fillings accounts for 80 % ~ 90 % of the total flavoring. With the worldwide transformation from acid to medium and alkaline, calcium carbonate fillers have been widely used in the wet part of paper making and gradually replaced the Kaolin and talc fillers used in the past. In fact, the direct application of calcium carbonate fillers to alkaline copier paper still has many problems. The hydrogen bond between calcium carbonate fillings and fiber cannot produce, not only limit the amount of fillings, but also cause the physical strength of the paper industry to drop and so on.

Wooing [8] et al. found that the size of shell powder is smaller and particle size is more even. The small particle size and narrow particle size distribution make the packing material have higher scattering ability, the opacity and light scattering performance of the filling paper are also higher. For KP Reed pulp paper, acid sulfite Luweijiang, bleached broad-leaf pulp sheet filler, although the anti-Tensor index, tear index and anti-breakage index of shell powder have been reduced to a certain extent, but the whiteness, opacity, light scattering coefficient and ash have been improved.

Conclusion

The application of shell powder has attracted the attention of research scholars. Through further research, shell powder will be applied in a more extensive and extensive field. The abandoned shells will turn waste into treasure, providing more help for human life.

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