Extraction of natural chitosan oligosaccharides from shell and preparation of natural sunscreen

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Abstract. Shell is aquatic product processing industry waste, shrimp, crab and shellfish contain heavy metal, cause this kind of waste water deposits, the pollution caused by the Marine area, but the shell and shrimp shell contains rich off acetyl chitosan, chitosan degradation into shell oligosaccharides have many function effect, from the perspective of environmental protection is to deal with some of the pollution, and the preparation of the beneficial shell oligosaccharides. This paper introduces the extraction of chitosan from shrimp shells and the preparation of sunscreen by using physical degradation method to extract chitosan oligosaccharide from chitosan. In this paper, natural chito-oligosaccharides were extracted from shellfish waste and used as ingredients to make natural sunscreen, which was an exploration of chito-oligosaccharides in the field of daily use in fine chemical industry.

Key words: shell; oligosaccharide; sunscreen.

1. Introduction

The Shell is the mantle that lives on the water's edge, the mollusca, which has special glandular cells whose secretions form calcifications that protect the soft parts of the body, a biomineralization. With the improvement of people's living standards, seafood and Shell products have become ubiquitous table food, shell food in addition to edible parts, the hard shell became waste. At present, Chitooligosaccharides have been widely used in food, biomedicine and cosmetics. It has obvious functions of moisturizing, activating the cells of the body, preventing the growth of harmful bacteria on the surface of the skin, inhibit anti-skin disease and absorb UV effect, can be used in moisturizing, anti-wrinkle, sunscreen and other types of skin care products. In this paper, the extraction of Chitooligosaccharide is introduced. The core research method is to extract Chitooligosaccharide from Shell and degrade it to Chitooligosaccharide by physical degradation. Therefore, this article mainly elaborated the shell oligosaccharide extraction and the natural sunscreen preparation.

Chitooligosaccharides also play an important role in many aspects because of their excellent compatibility. This paper introduces the important role of Chitooligosaccharide in daily chemical industry, which has the function of anti-oxidation and moisturizing, is the main component of Sunscreen, is a new type of additive in fine chemical industry, and has the advantage of lower price than uric acid. Sun Protection is very important in daily life, the skin after the sun exposure is easy to black, there will be a variety of color spots, which is caused by ultraviolet UVA, long-wavelength Uva has a strong...
penetration, can stimulate pigment synthesis and cause the skin color to turn black, causes the freckle, the chloasma, the old age spot appearance or the aggravation. In addition to tanning, UV rays can cause skin aging, blotchiness, dryness, Telangiectasia, wrinkles, sagging and sagging. In addition, Sun Protection can remove the discoloration from the body, and injured cells release a chemical that stimulates capillary, also known as skin redness, which not only damages DNA, make the skin lose elasticity, serious still can cause skin disease or skin cancer, so sunblock is very important to human body health.

2. Experimental preparation

2.1. Reagents and instruments
Reagents: shellfish, hydrochloric acid solution, deionized water, sodium hydroxide solution, acetic acid solution, sodium carbonate solution, distilled water, preservative nipagin methyl Ester, formula A (liquid paraffin, monoglyceride stearate, vaseline, hexadecanol) Formula B (op-10, glycerol, distilled water)

Instruments: Oven, mortar, strainer (filter paper, brinell funnel, strainer, vacuum pump) , water bath, filter devices (funnel, filter paper, iron stand, glass Rod, beaker) , ultrasonic meter, scale, Test Tube, Gel dropper, measuring cylinder, tape, Quartz Tank, spectrometer

2.2. Experimental Procedure

2.2.1. Preparation of Chitosan. After removing the impurities from the shellfish wastes, the shellfish wastes are washed with distilled water and running water, the meat remains on the shellfish wastes are washed, and the shellfish wastes are placed, dry In oven (60 °C) , then grind in mortar. Then add HCL and soak for 2 hours to remove the calcium and inorganic salts in the mixture of hydrochloric acid, then rinse with deionized water to be neutral. Then add Naoh into the water bath for 2 hours (the temperature is 50 °c), remove the protein, filter, use deionized water 80 °c water bath reaction for 4 hours, wash to neutral, pumping filter. The white powder Chitin was obtained after drying, and Chitosan was obtained by deacetylation of Chitin.

2.2.2. Preparation of Chitosan Oligosaccharide. Chitosan was degraded in acetic acid solution by ultrasonic wave for 30 min. After being treated with sodium carbonate solution and distilled water, the neutral dry product Chitosan oligosaccharide was obtained.

2.2.3. Preparation of Sunscreen. The liquid paraffin, monoglyceride stearate, vaseline and hexadecanol of component a were uniformly mixed and heated to 85 ℃ according to the formula of sunscreen lotion. After heating the OP-10, glycerol and distilled water of component B to 85 ℃, adding the Chitosan oligosaccharide extract, the oil phase was stirred continuously until all the oil phase was mixed into the water phase In the next step, the product is emulsified and stirred eveny, and the preservative methyl nipagin is added into the product at the same time, waiting for the temperature to drop to 45 ~ 50 ℃ to stop the emulsification. The product is cold to room temperature.

Group A: Liquid Paraffin 2.5 g → monoglyceride 2.5 g → Vaseline 0.5 g → hexadecanol 1g;
Group B: op-100.75 g → Glycerol 1g → water 40.75 mL → chitooligosaccharide extract 1mL;
A and B were emulsified for 40 minutes at 70 ℃.

2.2.4. Determination of the performance of sunscreen. 1) Get a white milky product.
2) The thermal and cold stability of the prepared Chitosan Oligosaccharide sunscreen was tested.
3) Sunscreens were placed at-20 ℃,-5 ℃ for 24 hours and at 40 ℃ for 72 hours respectively, and the appearance of the products were observed: no precipitation, separation, discoloration, water seepage or coarse particles, fine appearance, good gloss, indicating good stability.
4) Cut the medical latex tape into a rectangular shape and stick the adhesive surface on the surface of the transparent side of the quartz pool. The glass rod is used to take the sample on the surface of the quartz pool with adhesive tape, and the sample is coated evenly. At the wavelength of 200-400nm, UV scanning was carried out. At 280nm, 300nm and 330nm, UV absorption existed.

3. Results and discussion

3.1. Humectant action
Chitosan oligosaccharide is a kind of high active oligosaccharide, which can play an important role in cosmetics because of its good moisture retention and hygroscopicity. Yang Sheng [1] and others put the Chitosan oligosaccharide weighing bottle with molecular weight of 3000 into the drying bottle, in which the saturated sodium carbonate solution with relative humidity of 43% is simultaneously packed, and put the weight before and after weighing for 12, 24, 36, 48 hours, the hygroscopic rate and the moisture retention rate are calculated by the formula, as shown in table 1. From the conclusion, Chitosan oligosaccharide has some hygroscopicity and hygroscopicity.

| Performance | 12 h | 24 h | 36 h | 48 h |
|-------------|------|------|------|------|
| Hygroscopic | 7.92 | 14.15| 15.84| 17.52|
| Moisture retention | 115.4 | 123.5| 126.1| 128.2|

Bu Xin et al [2] Modified Chito oligosaccharide to prepare a kind of Chito oligosaccharide with high hygroscopicity and hygroscopicity, and found that the hygroscopicity mechanism is the formation of a large polymer network structure, that binds the water molecules to the Mesh with hydrogen bonds. Hyaluronic acid is also a common moisturizing agent in cosmetics, Wang Luxia et al [3]. Found that Chitooligosaccharides and hyaluronic acid have similar structure and properties, which can replace hyaluronic acid in cosmetics, because hyaluronic acid production process is complex, expensive raw materials, high cost. The majority of chito-oligosaccharides come from natural renewable resources, the preparation method is simple and convenient, the production cost is lower than hyaluronic acid. Many countries have successfully developed cosmetics containing Oligochitosan, such as hand cream, skin cream and so on.

3.2. Antioxidation
Anti-oxidation is a self-protection mechanism to protect human body and animal body from free radical damage. The free radical is the organism produces has the strong oxidation, damages the organism cell and the organization the harmful compound, can cause the disease and the organism to be old. Chitooligosaccharide can scavenge free radicals and achieve the effect of anti-oxidation. Zhu Heng [4] and others used Chitooligosaccharide to carry on the ability of scavenging hydroxyl radical and reducing ability test, which proved that Chitooligosaccharide has certain ability of resisting human body oxidation and decrepitude. To detect the ability of chito-oligosaccharide to scavenge hydroxyl radical and to reduce hydroxyl radical, the reducing ability of chito-oligosaccharide is an important index of the ability of antioxidant to provide electron, it provides electrons that block the transition of iron ions to Ferric, turning free radicals into stable substances. Therefore, the degree of reduction can be judged by color reaction. The higher the absorbance after reaction, the stronger the reduction ability and the stronger the anti-oxidation ability. In a certain range of oligochitosan concentration, the reduction ability of Oligochitosan increased with the increase of the concentration. Xu Guizhu [5] took the Chinese mitten crab as the experimental object, studied the effect of adding different concentrations of Chitooligosaccharide to the Diet on the anti-oxidation ability, and obtained that the Chitooligosaccharide can reduce the damage of free radical to the body, it has a very important ability to improve the antioxidant side. By injecting Chitooligosaccharides into the abdominal cavity of piglets under oxidative stress, Gang Tian et al [6]. Concluded that Chitooligosaccharides could alleviate the weight loss induced.
by oxidative stress and improve the antioxidant capacity of piglets. Zhang Minhan et al. [7] studied the antioxidant ability of Chitosan oligosaccharide, Chitosan and carboxymethyl Chitosan. It was found that Chitosan oligosaccharide could eliminate hydroxyl radical more effectively than Chitosan and carboxymethyl Chitosan, and the scavenging ability increases with the concentration of the solution, ascorbic acid can also be anti-oxidation, at the same concentration, the study found that the clearance rate of Chitooligosaccharide is higher than ascorbic acid, so chitooligosaccharide is more and more accepted by the public, it has a broad prospect of utilization.

4. Conclusion
In this paper, Chitosan oligosaccharide was prepared and used to make Chitosan oligosaccharide, which can make use of the advantage of moisture retention and Sun Protection. Through the research and development of Shell Wastes, part of the resources can be reused, part of the reason is that it can alleviate the environmental problems of rivers and seas and other areas polluted by Shell. The origin of chitooligosaccharide was introduced. Chitin was obtained by deacetylation of protein and deacetylation. At the same time, the structure of Chitooligosaccharide was studied, and its unique functions were found from various functional groups, such as hydrogen ion binding, Ph balance, heavy metal adsorption and so on. The value of Chitooligosaccharide plays an important role in various fields, and at the same time, it solves pollution by reusing its resources, which in turn can continue to treat pollution and be applied in a wide range of fields, chito-oligosaccharide is becoming more and more important in bioengineering.

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