

Application and Safety Evaluation of Nano Materials in Food Packaging

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Abstract: Under the background of the continuous progress of science and technology and the continuous growth of social economy, the research and application of nano materials have been continuously deepened, and in the current food industry, nano materials have also been widely used, bringing a very promising application value. At present, when processing food packaging materials, by adding appropriate amount of materials, it can effectively improve and enhance the texture and fresh-keeping level of food packaging materials. At the same time, it also plays a great role in the good preservation of food nutrients, so as to better protect people's health. However, under the background of wide application of nanomaterials, people begin to question the safety of nanomaterials in food packaging, so it is necessary to evaluate the safety of nanomaterials.

1. Introduction

In the process of food processing, food packaging is an important part of the work, which plays a role in the protection of food nutrients and guarantees the stable development of food performance. In the context of the continuous improvement of people's living standards at this stage, the corresponding awareness of environmental protection and food safety has also been improved, so more and more attention has been paid to the quality of food, and the corresponding selection of food packaging materials has been gradually paid attention to. In recent years, with the continuous improvement of the level of science and technology, the research of nano materials has been in-depth, and the scope of application has been expanding. Through the application of nanotechnology, the synthesis and modification of food packaging materials can be realized, so that the original packaging materials can be changed to nano packaging materials, and have unique nano effects, such as nano particle interface effect and particle effect. At present, the scientific research on nano materials is in-depth, and it has made rapid development in many fields, such as medicine and coating, and its application value is very significant.

2. Application of Nano Materials in Food Packaging

2.1 Nano Titanium Dioxide

Titanium dioxide is used in food packaging materials, its main functions are antibacterial, coloring and so on. As a kind of photocatalysis semiconductor, nano titanium dioxide can produce high reducing electrons and photo oxidation holes under the condition of ultraviolet irradiation. The generation of holes can change the water and oxygen on the surface of nano titanium dioxide to a certain extent, and then promote the formation of hydroxyl radicals with enhanced degree of sampling, so as to damage it. It is this property of nano titanium dioxide that can keep the growth and reproduction of microorganisms [1]. In the past, high-quality nano titanium dioxide chitosan has been used in the research and development of Chinese herbal medicine, which makes the composite film preservative well formed. Under this background, the composite film has a very significant water retention effect, which can effectively reduce the internal water evaporation rate of Chinese herbal medicine fruit, at the same time, effectively avoid the phenomenon of internal and external exchange, and ensure that the effect of food preservation was significantly improved.

Titanium dioxide can effectively prevent the occurrence of video oxidation to a certain extent, ensure the occurrence of food decay and loss of nutritional value, and effectively extend the storage quality time of food [2]. In recent years, nano titanium dioxide has been gradually applied in food packaging materials, such as wrapping materials of tender ginger, which can effectively enhance the fresh-keeping effect, at the same time, greatly reduce the carbon dioxide transmission rate and significantly improve the oxygen transmission rate. Wrapping tender ginger with titanium dioxide can be stored at room temperature for up to one month, and improve the vitamin content . When we study the Bacteriostasis of nano titanium dioxide, we can know that under certain storage conditions, the inhibition effect of nano titanium dioxide into E.coli and Penicillium in tangerine is strong, so the storage and preservation effect of nano titanium dioxide in food packaging materials is better.

2.2 Nano Silver

Based on the efficient application of nanotechnology, inorganic antibacterial materials have been developed in large quantities. At present, as one of the new materials, nano silver ion is more stable in physical and biological properties compared with ordinary silver ion and other materials, and the corresponding antibacterial effect is more significant. Some studies have verified the performance of nano silver, that is, after corresponding photocatalysis and contact reaction, it can have corresponding rebel performance to play, which is mainly in the aspect of nano silver ion particle size factor, when the particle size is constantly small, it will increase the bacteriostasis. Even if nano silver is in a very small state, it will have a great bactericidal effect to play, and can kill hundreds of bacteria in a short time. At present, with the continuous improvement of science and technology, nano silver has been widely used in food security, health care and other fields, while the application of composite nano silver antibacterial agent in bone tableware can effectively reduce the breeding probability of bacteria and mold on tableware, and the occurrence of corresponding bacterial cross infection can also be effectively avoided, so as to promote tableware antibacterial The room has been extended, so its application prospect in the field of catering in public places is more significant [3].

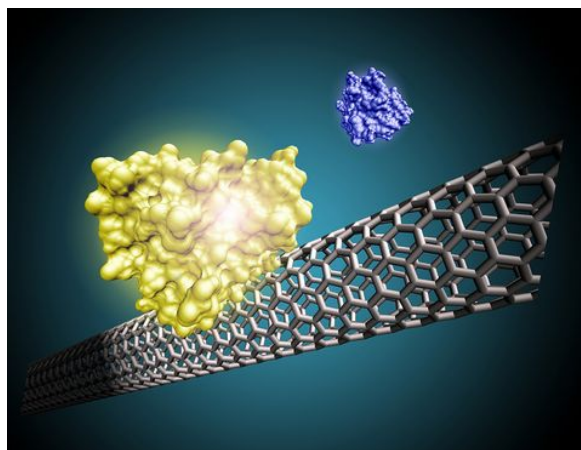


Fig.1 Sterile Tableware Made of Nano Materials

Adding nano silver ions into food preservation packaging materials can effectively reduce the oxidation rate of fruits and vegetables, and promote the preservation effect and storage time of fruits and vegetables. And some studies have shown that the application of silver and chitosan coated paper in tomato packaging materials can effectively slow down the flow of nutrients, and promote the normal temperature preservation time of tomato and other foods to a certain extent. And the application in Cucumber packaging materials can even promote its storage quality and strong antibacterial performance.

2.3 Nano Silicon Oxide

As a kind of inorganic non-metallic materials, nano-sized silicon oxide is characterized by non-toxic, tasteless and pollution-free, biocompatibility and good optical permeability. One of the main application materials of nano silicon oxide is nano silicon dioxide. In combination with organic

materials, it can effectively improve the thermal stability and toughness of materials, as well as its environmental friendliness and other characteristics, so it is widely used in coatings and plastics [4]. Some studies have shown that the silicon oxygen contained in the substance can effectively regulate the oxygen and carbon dioxide in the air, thus inhibiting the respiration of fruits and vegetables, and achieving the purpose of food preservation. In this case, the attention of nano silicon oxide in food packaging materials began to increase gradually. According to the relevant research on Gongyuan, the application of Nano-SiO₂ modified LDPE film can ensure the antioxidant and sensory properties of Gongyuan, and the application of this material in mango packaging materials can effectively delay mango aging, inhibit the occurrence of Peel Browning, and inhibit mango weight loss and softening Very significant.



Fig.2 Antiseptic, Rotten and Fresh-Keeping Bags of Nano Materials

3. Safety Evaluation of Nano Materials in Food Packaging

At present, there are many related technologies for the detection of nanomaterials, such as X-ray spectroscopy. Some special properties of nano materials are reflected in their phase and crystal structure, which promote the full play of the properties of nano materials. Because some different electronic motion conditions are often generated in the material atoms, and there is a certain difference in the wavelength of the emission light, so through the help and reasonable application of spectral analysis technology, the properties and crystal structure of nanoparticles can be effectively studied. Based on the analysis of X-ray diffraction spectrum, the crystal state and crystal structure can be better measured, At the same time, it can analyze the elements of nanomaterials scientifically and reasonably.

The characteristics of nanomaterials, such as photoelectricity, are special, so they are widely used in the food packaging industry. At present, people begin to attach great importance to the safety of nanomaterials application in their daily life, when the new food packaging materials dominated by nanomaterials are everywhere. Therefore, the research on the safety detection of nanomaterials also begins Go deep. In the process of safety verification, animal oral toxicity test is often used. In vivo, there are two types of toxic chivalrous shadow in nano examples: first, there is no correlation between the reaction and the composition of toxic effect; second, there is a direct relationship between the composition of nano particles and the toxic effect. Take metal nanoparticles as an example. If there are some such particles in the organism, there will be abnormal protein function when PR is combined. In this case, metal alloy and other substances will have genotoxicity to reflect indirectly or directly. Aiming at the safety research of nanomaterials in the application of food packaging materials, many targeted researches have been carried out at home and abroad, but there is no specific and more accurate research result on the safety of your materials. I believe that under the background of further improvement of science and technology level and continuous research on nanomaterials, there will be more accurate research results The

problem of what kind of effect nano materials will have in vivo will also be further effectively solved [5].



Fig.3 Nanomaterial Safety Test

4. Conclusion

With the extensive application and continuous in-depth research of nanotechnology, the current hot issues are also gradually tending to the improvement of the application quality and antibacterial efficiency of nano materials in food preservation packaging. In this case, the corresponding research solutions are also very significant. The application of nanotechnology and nanomaterials in food preservation and packaging can significantly inhibit the growth of microorganisms and prolong the storage time of goods; meanwhile, it also has a certain impact on the light absorption rate and thermal performance of packaging materials. The corresponding results are obvious and easy to see. Through the application of nanomaterials, it has an important positive effect on the maintenance of good quality of food.

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