MAPLE BLUSH

ADAGA®
CHITOSAN

CHITIN DEACETYLATION

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CHITOSAN

CHITIN DEACETYLATION

Adaga Food and Consultancy Industry Inc. was founded in 2011. Our company has successfully completed its TUBITAK project with the R&D studies it has carried out on production of Chitin - Chitosan out of Shellfish and its usage as an intermediate in various sectors. Our company of Chitin-Chitosan, which has never been produced in Turkey before, has started to operate in Antalya within the scope of SAN-TEZ Project of the Ministry of Science, Industry and Technology. Shellfish wastes can be put in good use and-turned intonew products instead of being left to rot. Chitin and its derivative chitosan are the primary products that are produced.

In this regard, with its R&D laboratories, our company can analyze the products at any time and it constantly carries out studies of formulation differentiation and improvement with its expert team in order to develop better products. We will keep working towards our goal of constant increase in customer satisfaction by rendering waste shellfish beneficial for public health using cutting edge science and technology.

ADAGA which develops its strategy based on scientific methods, paves its way into being among Turkey's and the world's outstanding corporate companies by constantly growing.

WHAT IS CHITIN?

The English word "chitin" is originated from the French word "chitine" which emerged for the first time in 1836. These words were derived from the Latin word "chitOn"which means mollusk.

Chitin is the second most common polymer in the world after cellulose. It is the main component of shellfish like crab and shrimp and it is also found in the structure of the skeletons of bugs and in the cell walls of fungi.

The chitin molecule has a long chain structure formed as a result of the repetition of two N-acetylglucosamine units which are connected with beta 1,4 bond. Chitin which is a polymer, essentially consists of polo-[B-(1,4)-2-acetamyd-2-deoxy-B-D glucopyranose] and also contains a very low rate of 2-amino-2-deoxy-B-glucopyranose monomers.

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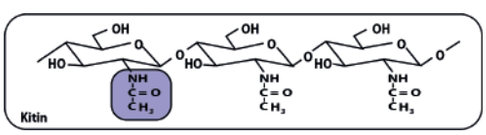
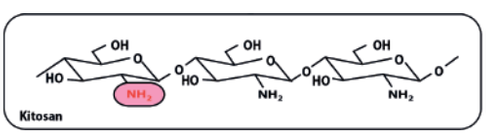
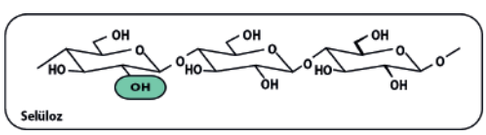
WHAT IS CHITOSAN?

Chitosan is a linear amino polysaccharide obtained through the deacetylation of chitin. Deacetylated chitin is called chitosan. The degree of deacetylation is defined as the ratio of the number of the amino groups to the number of the acetyl amino groups. As a result of deacetylation, chitin can approach chitosan with a rate of deacetylation of 70-95%. Chitosan is a linear polysaccharide obtained via the deacetylation of chitin in an alkali setting that consists of D-glucosamine units with B(1,4) bonds which has a molecular weight of approximately 3.200 — 2.000.000 g/mol.







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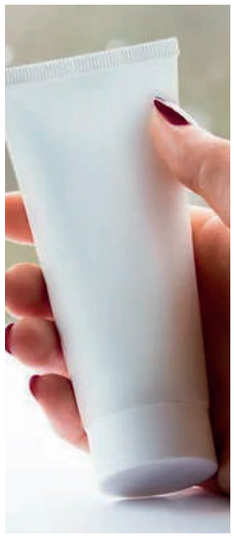
FIELD OF APPLICATION	SIPECIFIC USES
Water Treatment	Coagulation and flocculation for polluted waste water Removal of metal ions from waste water and its recycling
Agriculture	Plant additives Antimicrobial, antifungal material Plant seed coating Making of fertilizer In insecticides and nematocysts
Biotechnology	In chromatographic methods In enzyme immobilization
Food	Natural thickener Food additive including feeding stuff Filtering and cleaning Hypocholesterolemic agent (weight loss agent) Shelf life extender for food Enzymatic browning retarder
Cosmetics	Making of hair styling products Skin hydrators (in moisturizing creams) Weight loss agent as a fat binder Anti-odor agent in aftershaves, deodorants Anti-sebum mask
Medical Field	In making of first aid bands for animals and humans In making of tourniquets and wound treatment (speeds up wound treatment by 50%) Pain relieving and healing effect in burn injury treatments Blood coagulator hemostatic agent Making of hydrogel Anticoagulant and anti-thrombogenic agents (as sulfated chitin derivatives) Anti-cholesterol effect Making of contact lenses Articular cartilage tissue treatment Nipple treatment in mammals Hygienic milking with antimicrobial and antifungal effects in milking





THE EFFECT OF CHITOSAN IN FIELDS OF USAGE

Antibacterial, antifungal and antiviral effect

Chitosan contains reactive amino (NH_2) groups in its structure. These free amino groups form the fundamentals of the physical and chemical features of chitosan. The antimicrobial effect of chitosan is caused by its polycationic feature. Since it is effective on negative loaded agents, it is effective against bacteria, yeast, and mold and pathogen viruses. The distribution of negative and positive ions on the it 2Y surface changes as a result of electrostatic interaction and this leads to deterioration in membrane stability and its permeability changes. When the membrane permeability changes, food stuff cannot get inside the cell or the intracellular component leaks out, as a result of which the cell dies. It is noted that the first point of effect of chitosan and its derivatives is the cell wall and the death of organism is caused by deterioration in the composition of the membrane.

Anti-hemorrhagic Effect — Hemostatic Agent

These particles made of shrimp shell form a cruciate ligament in order to form a strong clot completely independent of the red blood cells and the natural coagulation mechanism of the body. And this means ensuring fast coagulation even in cases of mild or severe arterial/venous bleedings where anticoagulant (blood diluter) heparin is involved. In addition to the cruciate ligaments it forms with red blood cells, it has a blood thickening effect. It essentially holds and absorbs water molecules which are the main components of the blood. Since it creates its own clot, it is not affected by the possibility of the body temperature reaching extreme highs or lows.

Its effect on the regenerative activity on connective tissue and on speeding up the formation of bone producing cells (osteo - blast)

It is noted that chitosan is a very convenient biomaterial in connective tissue regeneration due toits similarity to the glycosaminoglycan in the tissuematrix. It is also known that chitosan stimulates the growing factors.

Due these features, it was demonstrated that chitosan increases wound epithelization and speeds up the neuron and vein regeneration in dermis, thus it is convenient to be used as wound dressing in treatment of burn injuries and severe skin damages.

Polymer structure acts as a carrier matrix for bioactive agents as well as co-operating with cells in the setting. When it's applied, it draws the erythrocytes to the wound opening via electrostatic interactions and ensures coagulation and it helps increasing the health tissue by helping enrich the cells in the zone.

THE EFFECT OF CHITOSAN IN FIELDS OF USAGE

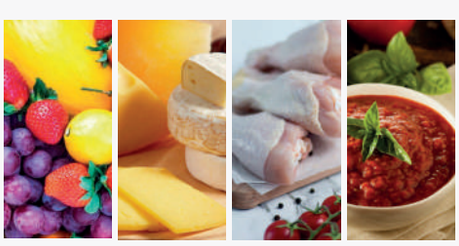
Chelation of metal ions

The metal binding capacity of chitosan is surprisingly restricted to transition metals (heavy metals like Au Ag Cu Cr Ni Zn Mn Co Mo Fe Hg Pd Cd because alkali (Li Na K Rb Cs and Fr) earth metals (Be Mg Ca Ba Sr Ra) cannot bind to chitosan properly. This situation gives chitosan the ability to bind heavy metalsselectively. Chitosan is vastly used in various industries for the removal or recycling of metal ions.

Its effect on weightloss

Chitosan acts literally as a "fat sponge"in stomach. This description is due to the fact that it has a capacity to bindl 2 times its own weight of fat. In comparison to fibers of similar features, it was seen that it helps remove 5 - 10 times more fat from the body. Chitosan is a material which essentially acts as a diet fiber and very small amount of which mixes up with the blood. It has an effect of weight loss since it catches fat molecules and extracts them from the digestive tract. It helps bind and remove from the body the fat molecules we ingest through our diet before they mix up with the blood and accumulate in body parts like hips and waist.

Its effect on food industry



Chitosan and its derivatives have areas of usage like antimicrobial, antioxidant, emulsifier, thickener, stabilizer, clarifier and de-acidifier, anti-enzymatic browning and diet fiber source. It is also used in coating and edible film production, in enzyme immobilization and food stuff encapsulation. In food industry it is mostly used as food preserver.

To that end, it is usually used as a part of the packing material to help prevent the emergence of microorganisms, thus improving the quality and shelf life of the food. It was stated that using chitosan as packing material prevents loss of moisture on the food surface, thus the decrease in the product weight is prevented and stiffening and retrogradation is delayed. Since chitosan packages and films are more permeable towards 0_2 rather than CO_2, when fruits are packed with chitosan anaerobic respiration is prevented, speed of respiration is decreased, mold development is inhibited, ethylene synthesis and carbon dioxide transition is decreased which lead to delay in maturation.

Its ability to bind protons makes chitosan an antacid. Besides, due to its cationic and macromolecular structure, chitosan can be used as a clarifier agent. Therefore, it was noted that chitosan may be effective in removal of colloidal and dispersed particles in waste waters of food processing and in fruit juice production.

Since meat and meat products contain a high level of fat, they are prone to lipid oxidation and due to their high nutritional content they are quite vulnerable to microbial decomposition. Due to the antioxidant and antibacterial activity of chitosan, it may be effective on delaying the lipid oxidation on meat and meat products during storage, preventing the emergence of deteriorating and pathogen bacteria and in this way improving the shelf life and sensory and microbial quality of products.

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Its anti-cholesterol Effect

Chitosan helps reduce cardiovascular damage done by excess fat. As a result of this, a decrease in blood cholesterol and triglyceride occurs. Moreover, since it's good at binding bile acids, it helps increase the good cholesterol (HDL)/bad cholesterol (LDL) ratio. Because the body uses LDL to create bile acid; so, as the amount of bile acid drops in the body, the body uses LDL, thus decreasing the amount indirectly.

The influence in the field of Agriculture

It has antibacterial, antifungal, antimicrobial, insecticidal activity. It neutralizes the diseases that can enter the plant from the injured tissues formed in the body of the plants. It provides protection of the plant from diseases by using it in soaking the seeds in water and planting seedlings. It cleans the vascular bundles of plants. It ensures that the pesticides and fertilizers used are spread homogeneously on the leaf surface. By increasing the effect of pesticides in agricultural control, it destroys fungi, bacteria and pests that are immune to pesticides. It inhibits the production of Aspergillus flavus and metabolites such as Aflatoxin and Ochratoxin in products such as corn, hazelnut, pistachio, grapes and figs.

EDIBLE BIOPOLYMER

Zero Toxicity
No Residue

ANTIOXIDANT EFFECT

Helps prolong the shelf life of products after harvest.

BIOSTIMULANT EFFECT

Activates the Immune Systems. It is preventive and curative.

ANTIMICROBIAL EFFECT

Destroys mold yeast, bacteria, prevents the spread of viruses and pests (red spider mite, oystershell scale, nematode, russet mite, etc.)

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