Claims

1.

~~1.~~ A chitosan derivative characterized in that chitosan is modified with ~~a molecule capable of the peptide bond formation~~glutathione with the formation of a peptide bond~~.~~

~~2. The derivative of claim 1, wherein the peptide bonds are present between amine groups of units of poly(2-deoxy-2-aminoglucose), and available carboxyl groups of the molecules capable for peptide bond formation.~~

~~3. The derivative of any of claims 1 or 2, wherein the molecule containing a carboxyl group is selected from carboxylic acids, amino acids, amino acid analogues, dipeptides, tripeptides, tetrapeptides, peptides composed of more than four amino acids, proteins or any mixture thereof.~~

~~4. A method for synthesis of an insoluble biopolymer derivative comprising forming a peptide bond between an amine or carboxyl group of a unit in the biopolymer containing reactive amine or carboxyl groups, and one of the available carboxyl or amine groups of the molecule being attached comprising formation of the peptide bond between the amine groups of units of poly(2-deoxy-2-aminoglucose) and the modifier molecules, in the field of microwaves.~~

~~5. The method of claim 4, comprising:~~

~~a) reacting a molecule with Fmoc-Cl in a suitable solvent, preferably dioxane;~~

~~b) dissolving the Fmoc- molecule in a solvent, preferably DMF, and reacting the Fmoc-molecule with the biopolymer in the presence of HBTU, HOBt and DIPEA;~~

~~c) deprotecting the molecule by removal of Fmoc group and~~

~~d) suspending the biopolymer with the attached molecule in distilled water and lyophilizing thereof.~~

~~6. The method of claim 5, wherein the step of obtaining the Fmoc-protected molecule is dispensible.~~

~~1.~~ 7. ~~.The method of claim 5 or 6, comprising:~~

~~a) processing the biopolymer with microwaves in a suitable solvent,~~

~~b) adding the activators~~ to ~~activate the function group of the biopolymer,~~form chitathion.

~~c) adding the unprotected capable of the peptide bond formation molecule and~~

~~d) processing the reaction mixture with microwaves,~~

e) washing the obtained modified biopolymer and lyophilizing thereof.

8. The method of claim 5-7, wherein said activators are either DCC and HOPfp or HBTU, HOBT and DIPEA.

1. 9. The method of any of claims 5-8, wherein the microwave processing is continued for 1-30 minutes.

10. The method of any of claims 4-9, wherein the biopolymer is chitosan and/or the modifier molecule is at least one of carboxylic acids, amino acids, amino acid analogues, dipeptides, tripeptides, tetrapeptides, peptides composed of more than four amino acids, proteins or any mixture thereof, preferably the tripeptide molecule is glutathione.

2. 11. A cosmetic or pharmaceutical composition containing a biopolymerchitosan derivative chitathion of any of claimsclaim 1-3 with pharmaceutically acceptable excipients.

12. A cosmetic or pharmaceutical composition according to claim 11 wherein a chitosan derivative is glutathione modified chitosan.

3. 13. The composition of claim 12, in form of an ointment, cream or lotion.

14. The composition of claim 11 or 12, for use in medicine.

15. The composition of claims 11-142, for use in preventing symptoms of allergy caused by heavy metals, preferably palladium, cobalt, chromium, gold and nickel, especially caused by the contact of skin with nickel..

4. 16. The composition of claims 11-15, wherein the composition contains an additional biopolymer, preferably a biopolymer being a metal binding protein.

17. The chitosan derivative of claims 1-claim 3, for use in preventing symptoms of skin allergy caused by the contact with metals, especially heavy metals, in particularof skin with nickel.

5. A method for synthesis of insoluble chitosan derivative, characterized in that the formation of a peptide bond between an amine or carboxyl group of a unit in the chitosan, and one of the available carboxyl or amine groups of the molecule being attached is carried in the field of microwaves, to form the peptide bond between the amine groups of units of poly(2-deoxy-2-aminoglucose) and the modifier molecules.

6. The method of claim 5, comprising:

a) reacting a glutathione with fluorenylmethoxycarbonyl-Cl (Fmoc-Cl) in a suitable solvent, preferably dioxane;

b) reacting the fluorenylmethoxycarbonyl-glutathione (Fmoc-glutathione) with the biopolymer in the presence of 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate (HBTU), hydroxybenzotriazole (HOBt) and N,N-diisopropylethylamine (DIPEA);

c) deprotecting glutathione by removal of fluorenylmethoxycarbonyl protecting group and

d) suspending chitosan with the attached molecule in distilled water and lyophilizing thereof.

7. The method of claim 5 or 6, comprising:

a) processing the chitosan with microwaves in a suitable solvent,

b) adding the activators to activate the function group of the biopolymer, wherein said activators are preferably 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate (HBTU), hydroxybenzotriazole (HOBt) and N,N-diisopropylethylamine (DIPEA),

c) adding the unprotected capable of glutathione, and

d) processing the reaction mixture with microwaves,

e) washing the obtained modified chitosan and lyophilizing thereof.

8. The method of any of claims 5-7, wherein the formation of peptide bonds is carried out solely with the microwaves and no activators are used.

9. The method of any of claims 5-8, wherein the microwave processing is continued for 1-30 minutes.

~~18. A use of biopolymer derivative of any of claims 1-3 in medicinal or cosmetic products.~~

10. ~~19. The use of~~ The chitosan derivative of claim 1 for use for preparing a cosmetic or pharmaceutical composition for preventing symptoms of allergy caused by heavy metals.

11. The chitosan derivative of claim ~~1 or 2 and/or chitosan to prevent symptoms or alleviate heavy metal allergies~~10, for use for preparing a cosmetic or pharmaceutical composition for preventing symptoms of allergy caused by palladium, cobalt, chromium, gold and nickel.

12. ~~20. The use of claim 19, wherein the~~ The chitosan derivative ~~is glutathione-modified chitosan, to prevent or alleviate~~of claim 11, for use for preparing a cosmetic or pharmaceutical composition for preventing symptoms of ~~nickel~~skin allergy caused by the contact with nickel.

~~21. The use of claims 18-20, wherein the composition contains an additional biopolymer, preferably a biopolymer being a metal binding protein.~~

13. ~~22. A matrix for attaching modifier molecules, containing the biopolymer~~Use of the chitosan derivative ~~of any of claims~~according to claim 1~~-3.~~

~~23. A method~~ for ~~purification of~~ industrial and ~~domestic waste wherein the biopolymer derivative of any of claims 1-3 is contacted with said waste to entrap the pollutants and said biopolymer derivative with entrapped pollutant is resolved.~~

~~24. A method for recovery of metals wherein the material containing metal ion is contacted with the biopolymer derivative of any of claims 1-3.~~

municipal waste, especially nickel removing.