Abstract:

A nano protection coating for jewelry and method are disclosed which is formed from the listed materials by weight: aminopropyltriethoxysiliane 0.5-3, Al₂O₃ 1-5, SiO₂ 15-25, isopropyl alcohol 20-30, H₂O 35-42. The producing method for nano protection coating of jewelry comprises the following steps: firstly, 1—15 (weight units) of isopropyl alcohol is put into the SiO₂ nano powder and mixed evenly, then the Al₂O₃ powder and aminopropyltriethoxysiliane are put in, finally, the surplus isopropyl alcohol & the water are put in and mixed evenly until the coating liquor is produced. Secondly, the surface of the jewelry is cleaned. Thirdly, the coating liquor is sprayed onto the surface of the jewelry. Fourthly, the surface of the jewelry is dried, and then a strong solid protection coating is produced on the surface of the jewelry. Provided is a coating for jewelry, which has the effect of high rigidity, nice protection, and not easy to be damaged, and also provided is a simple and low cost method for jewelry coating.
NANO PROTECTION COATING OF JEWELRY AND METHOD THEREOF

FIELD OF THE INVENTION
The present invention relates to jewelry protection, more particularly, the protection coating of jewelry surface and method thereof.

BACKGROUND OF THE INVENTION
Traditionally the protection coating of the jewelry surface usually employs the method of electroplating on the jewelry surface. Durable metal like gold, silver, platinum, copper, rhodium are used such that the applied item is protected against wearing down and tarnishing. Such metal are relatively easy to be molded, shaped and polished. However, the electroplating coating on the applied surfaces is easy to be worn down and damaged. In addition, this method cannot be applied to the surfaces of certain gem, especially to the gem with fragile surfaces. Furthermore large amount of toxicant are produced and the environment is polluted when undergoing electroplating processes.

SUMMARY OF THE INVENTION
This invention applies a new technical solution to resolve the mentioned problem. An aspect of the present invention is to provide a coating of jewelry with the advantages of long lasting protection, high rigidity and durable to damages. Another aspect of the present invention is to provide a simple and low cost method for the coating of jewelry. The present invention provides a nano protection coating for jewelry, which is comprised by the following materials by weight:
aminopropyltriethoxysilane 0.5-3, Al₂O₃ 1~5, SiO₂ 15-25, isopropyl alcohol
20-30, H₂O 35-42.

In the mentioned materials, the Al₂O₃ and SiO₂ are nano powder with a mean particle diameter of 10~20nm.

The process for nano protection coating of jewelry comprises the following steps.

Firstly, 10-15 (weight units) of isopropyl alcohol is put into the SiO₂ nano powder and mixed evenly, then the Al₂O₃ powder and aminopropyltriethoxysilane are put in, finally, the surplus isopropyl alcohol & water are put in and mixed evenly until the coating liquor is produced.

Secondly, the surface of the jewelry is cleaned.

Thirdly, the coating liquor is sprayed on the surface of the jewelry.

Fourthly, the surface of the jewelry is dried, and then a strong solid protection coating is produced on the surface of the jewelry.

Advantageously, the above-mentioned method further comprises the following step:

the polishing process is employed before the coating is completely dry, the desiccation is continuously employed after the polishing process till the coating is dried out, and then a strong solid protection coating is produced on the surface of the jewelry.

Advantageously, the above-mentioned method is more preferred to comprise the following steps.

Firstly, 10-15 (weight units) of isopropyl alcohol is put into the SiO₂ nano powder and mixed evenly, then the Al₂O₃ powder and aminopropyltriethoxysilane are put in, finally, the surplus isopropyl alcohol & the water are put in and mixed evenly until the coating liquor is produced.

Secondly, the dust and stain on the surface of the jewelry are rubbed and cleaned. The surface of the jewelry is kept to be clean and dry, and also free of oil.
Thirdly, the coating liquor is sprayed onto the surface of the jewelry.

Fourthly, the surface of the jewelry is dried, and the polishing process using the polishing machine is employed before the coating is completely dry, then the desiccation is employed continuously after the polishing process till the coating is dried out, and then a strong solid protection coating is produced on the surface of the jewelry. Advantageously, it is most preferred for the above-mentioned method to comprise the following steps.

Firstly, 10-15 (weight units) of isopropyl alcohol is put into the SiO$_2$ nano powder and mixed evenly, then the Al$_2$O$_3$ powder and aminopropyltriethoxysilane are put in, finally, the surplus isopropyl alcohol & the water are put in and mixed evenly until the coating liquor is produced.

Secondly, the dust and stain on the surface of the jewelry is cleaned. The surface of the jewelry is kept to be clean and dry, and also free of oil.

Thirdly, in the working condition free of dust and oil, the coating liquor is sprayed onto the surface of the jewelry by the spray-gun till the surface of the jewelry is averagely coated. The caliber of the spray-gun is from 0.1mm to 0.3mm.

Fourthly, the coating can be dried off naturally within 3-6 hours, and the polishing process using the sponge polishing machine is employed before the coating is completely dry, then the desiccation is continuously employed after the polishing process till the coating is dried out, and then a strong solid protection coating is produced on the surface of the jewelry.

The present invention employs a method that spraying coupling agent powder onto the surface of the jewelry, and forming a coating with the features of transparence, achromatism and high rigidity. The thickness of the coating is several nanometers. The coating will not affect the outlook of the jewelry, but fills hairline crack on the
jewelry surface, and in turn, causes the surface to be brighter and more translucent. The substances which may cause the jewelry to be tarnished and oxidated is separated from the jewelry. The protection coating is more wearable. And the corrosion caused by ordinary sweat, the tarnishing and oxidization are prevented from the jewelry for longer and more completely. It is more valuable for the method of spraying to be applied to the precious alloy, softer precious metals and gem with fragile surface. Furthermore the protection coating according to the invention also can be used to the traditional technologies, such as the electroplating surface. Due to the unique reflection characteristics of the materials, the protection coating according to the present invention provides the jewelry various designs that present a unique and dazzling appearance. More importantly, the process of the invention produces much less pollution and environmental damage.

**DETAILED DESCRIPTION OF THE INVENTION**

**Embodiment 1**

The present invention provides a nano protection coating of jewelry, which is comprised by the following materials by weight:

- aminopropyltriethoxysilane($\text{H}_2\text{NCH}_2\text{CH}_2\text{Si(OC}_2\text{H}_3)_3$) 3, Al$_2$O$_3$ 1, SiO$_2$ 25, isopropyl alcohol 25, H$_2$O 35, wherein, the Al$_2$O$_3$ and SiO$_2$ are nano powder with a mean particle diameter of 10nm.

The process for nano protection coating of jewelry comprises the following steps.

Firstly, 12 (weight units) of isopropyl alcohol is put into the SiO$_2$ nano powder and mixed evenly, then the Al$_2$O$_3$ powder and aminopropyltriethoxysilane are put in, finally, the surplus isopropyl alcohol & the water are put in and mixed evenly until the coating liquor is produced.
Secondly, the dust and stain on the surface of the jewelry are cleaned. The surface of the jewelry is kept to be clean and dry, and also free of oil.

Thirdly, in the working condition free of dust and oil, the coating liquor is sprayed onto the surface of the jewelry using the spray-gun till the surface of the jewelry is average coated, wherein, the caliber of the spray-gun is 0.1mm.

Fourthly, the coating can be dried off naturally for 3 hours, and the polishing process using the sponge polishing machine is employed before the coating is completely dry, and the desiccation is continuously employed after the polishing process till the coating is dried out, and then a strong solid protection coating is produced on the surface of the jewelry.

Embodiment 2,
The present invention provides a nano protection coating of jewelry, which is comprised by the listed materials by weight:
aminopropyltriethoxysilane 1, Al₂O₃ 4, SiO₂ 20, isopropyl alcohol 30, H₂O 42, wherein, the Al₂O₃ and SiO₂ are nano powder with a mean particle diameter of 20nm.

The producing method of nano protection coating of jewelry comprises the following steps.

Firstly, 15 (weight units) of isopropyl alcohol is put into the SiO₂ nano powder and mixed evenly, then the Al₂O₃ powder and aminopropyltriethoxysilane are put in, finally, the surplus isopropyl alcohol & the water are put in and mixed evenly until the coating liquor is produced.

Secondly, the dust and stain on the surface of the jewelry is cleaned. The surface of the jewelry is kept to be cleaned and dried, and also free of oil.

Thirdly, in the working condition free of dust and oil, the coating liquor is
sprayed onto the surface of the jewelry using the spray-gun till the surface of the jewelry is averagely coated, wherein, the caliber of the spray-gun is 0.3mm.

Fourthly, the coating can be dried off naturally for 6 hours, and the polishing process using the sponge polishing machine is employed before the coating is completely dry, and the desiccation is continuously employed after the polishing process till the coating is dried out, and then a strong solid protection coating is produced on the surface of the jewelry.

Embodiment 3,
The present invention provides a nano protection coating of jewelry, which is comprised by the listed materials by weight:
aminopropyltriethoxysilane 0.5, Al₂O₃ 5, SiO₂ 15, isopropyl alcohol 20, H₂O 40, wherein, the Al₂O₃ and SiO₂ are nano powder with a mean particle diameter of 15nm.

The producing method of nano protection coating of jewelry comprises the following steps.

Firstly, 10 (weight units) of isopropyl alcohol is put into the SiO₂ nano powder and mixed evenly, then the Al₂O₃ powder and aminopropyltriethoxysilane are put in, finally, the surplus isopropyl alcohol & the water are put in and mixed evenly until the coating liquor is produced.

Secondly, the dust and stain on the surface of the jewelry is cleaned. The surface of the jewelry is kept to be cleaned and dried, and also free of oil.

Thirdly, in the working condition free of dust and oil, the coating liquor is sprayed onto the surface of the jewelry using the spray-gun till the surface of the jewelry is averagely coated, wherein, the caliber of the spray-gun is 0.2mm.

Fourthly, the coating can be dried off naturally for 4 hours, and the polishing
process using the sponge polishing machine is employed before the coating is completely dry, and the desiccation is continuously employed after the polishing process till the coating is dried out, and then a strong solid protection coating is produced in the surface of the jewelry.

All the coating liquor for the protection coating in these cases contains the following features that have been approved by the authorized test.

Color, achromatous and translucent
Viscosity (CPS), 30 to 50
Proportion, 1.09 to 1.14
Thickness of the coating, 5 to 10 um per time
Content of solid component, 15 to 17%

1. Rigidity Test for the coating. The test is conducted with the test result by SGS Taiwan Ltd.
   The test condition in laboratory, environment temperature, 23±2°C, relative humidity 50±5%RH
   The test method employed in laboratory, ASTM D3363-00 Standard Test Method for Film Hardness by Pencil Test.
   The rigidity of pencil: 6B-5B-4B-3B-2B-HB-F-H-2H-3H-4H-5H-6H
   soft ←-------------------→ hard

   The test result, 6H

2. Chemistry resistance Test for the coating. The test is conducted with the test result by SGS Taiwan Ltd.
   The test condition in laboratory, environment temperature, 23±2°C, relative
humidity 50±5%RH

The test method employed in laboratory, ASTM D1308—02el Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes (Spot Test,Covered)

The acid liquor, 5% H₂SO₄ solution

The duration of the test, 24H

The temperature of the test, 23±2°C,

The appearance of the sample is observed by eyeballing after the test.

The test result, no abnormal observation for the acid dipping test.

From the test result, it has been approved that the coating of this invention has features of high rigidity, wearable capability and scraping-resistant capability. No abnormal status can be observed after the acid dipping test, which proves that the coating of this invention is stable in the chemical property, and corrosion resistant. To sum up, the coating according to the present invention is an ideal protection coating for all kinds of jewelry.
What is claimed is:

1. A nano protection coating of jewelry, which is comprised by the following materials by weight:
   aminopropyltriethoxysilane 0.5~3, Al₂O₃ 1~5, SiO₂ 15~25, isopropyl alcohol 20-30, H₂O 35-42.

2. The nano protection coating of jewelry according to claim 1, wherein, the materials of Al₂O₃ and SiO₂ are nano powder with a mean particle diameter of 10~20nm.

3. The process for nano protection coating of jewelry, which comprises the following steps:
   firstly, 10~15 (weight units) of isopropyl alcohol is put into the SiO₂ nano powder and mixed evenly, then the Al₂O₃ powder and aminopropyltriethoxysilane are put in, finally, the surplus isopropyl alcohol & the water are put in and mixed evenly until the coating liquor is produced;
   secondly, the surface of the jewelry is cleaned;
   thirdly, the coating liquor is sprayed onto the surface of the jewelry;
   fourthly, the surface of the jewelry is dried, and then a strong solid protection coating is produced in the surface of the jewelry.

4. The producing method for nano protection coating of jewelry according to claim 3, wherein, the method further comprises the following step:
   the polishing process is employed before the coating is completely dry, and the desiccation is continuously employed after the polishing process till the coating is dried out, and then a strong solid protection coating is produced on the surface of the jewelry.

5. The producing method of nano protection coating of jewelry according to
claim 4, wherein, which comprises the following steps:

firstly, 10-15 (weight units) of isopropyl alcohol is put into the SiO₂ nano powder and mixed evenly, then the Al₂O₃ powder and aminopropyltriethoxysilane are put in, finally, the surplus isopropyl alcohol & the water are put in and mixed evenly until the coating liquor is produced;

secondly, the dust and stain on the surface of the jewelry are rubbed and cleaned to keep the surface of the jewelry clean and dry, and also free of oil;

thirdly, the coating liquor is sprayed onto the surface of the jewelry;

fourthly, the surface of the jewelry is dried, and the polishing process using the polishing machine is employed before the coating is completely dry, and the desiccation is continuously employed after the polishing process till the coating is dried out, and then a strong solid protection coating is produced on the surface of the jewelry.

6. The producing method of nano protection coating of jewelry according to claim 5, wherein, which comprises the following steps:

firstly, 10~15 (weight units) of isopropyl alcohol is put into the SiO₂ nano powder and mixed evenly, then the Al₂O₃ powder and aminopropyltriethoxysilane are put in, finally, the surplus isopropyl alcohol & the water are put in and mixed evenly until the coating liquor is produced;

secondly, the dust and sprayy on the surface of the jewelry are cleaned to keep the surface of the jewelry clean and dry, and also free of oil;

thirdly, in the working condition free of dust and oil, the coating liquor is sprayed onto the surface of the jewelry using the spray-gun till the surface of the jewelry is averagely coated, and the caliber of the spray-gun is from 0.1mm to 0.3mm;

fourthly, the coating can be dried off naturally within 3-6 hours, and the
polishing process using the sponge polishing machine is employed before the coating is completely dry, and the desiccation is continuously employed after the polishing process till the coating is died out, and then a strong solid protection coating is produced on the surface of the jewelry.
INTERNATIONAL SEARCH REPORT

International application No.  PCT/CN2008/000406

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: C23C, C04B, B05D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI, CNPAT, WPI, EPDOC, PAI: jewel; jewelry; gem; gemsto x; diamond; precious stone; coat+; alumina; aluminum oxide; Al2O3; silica; silicon oxide; SiO2; alcohol; silane; protect

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

- * Special categories of cited documents:
  - "A" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier application or patent but published on or after the international filing date
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  - "P" document published prior to the international filing date but later than the priority date claimed
  - "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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  - "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search 13 Jun.2008(13.06.2008)

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Name and mailing address of the ISA/CN
The State Intellectual Property Office, the P.R.China
6 Xitucheng Rd., Jiemen Bridge, Haidian District, Beijing, China 100088
Facsimile No. 86-10-620 1945 1

Authorized officer Ll, J. agang
Telephone No. (86-10)62084833

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INTERNATIONAL SEARCH REPORT
Information on patent family members

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CLASSIFICATION OF SUBJECT MATTER

C23C 26/00 (2006.01) i
C04B 41/50 (2006.01) i
B05D 1/12 (2006.01) i