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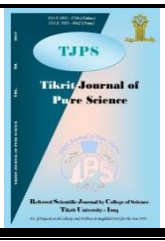

Study of the Topography and Optical Properties of The Silver Nitrate Nanoparticle Compound

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ABSTRACT

The paper aims to study the structural and optical properties of the pressed silver nitrate nanoparticle compound, and know its advantages after pressing.

When studying topography of surface the nanoparticle silver nitrate compound through AFM, and studying the optical properties of its solution through the UV for UV device has this working Mechanism, the highest absorbance we obtained was only at the wavelength of 301nm is, that is, within the visible spectrum (300-700) nm.

By studying the topography of silver nitrate we note surface smoothing and optical properties of the silver nitrate nanoparticle solution, we conclude that the wavelength of the substance is little, i.e. its energy is high (the absorption energy), Therefore, it is used in the field of medical treatments, and deep wounds sterilization.

To increase the efficiency of the silver nitrate compound, it can be converted into a Nano compound by grinding, and pressing.

1- Introduction

The Professor Norion Tanignchi used the term nanotechnology for the first time in 1974 at the University of Tokyo, it includes the ability for engineering the substances accurately with the nanometer scale, that is, it designing and manufacturing substances, devices, and systems with the control of the dimensions of the substance in the nanometer scale, which is one of a billion of meters, and in the nanoscale is about 100nm or less, where changes are appear in the substances in their optical, magnetic, electrical, chemical, and physical properties. Nanotechnology became a solution to the medical problems, but there are risks in dealing with Nano-substances. This technology was used to detect the vital toxins, such as anthrax, treatment of the simple type of cancer with a small degree, skin creams, and cosmetics of skin tanning. One of the forms of nanotechnology is Nano composites, which differ in their properties from the original material. One of the analytical methods, and the technologies that used in the study of the properties of Nano substance is the Atomic Force Supply (AFM) to study the topographic of substances surface[1]. Nano-substances properties are internal granules measurements range from (1 to 100) nm, and 100 nm substances have different properties from the larger dimensional substance and may be organic, inorganic, natural or synthetic and the resistance of the metallic substances increases, and the hardness values increase and the melting degree of the Nano-substance is less than the basic substance and the magnetic intensity of the substance increases as small as nanoparticles and the electrical capacity in the electrical conductivity increases as small as nanoparticles and more nanoparticles are homogeneous in the same size, the more they interact[2].

Nanoparticles are an atomic or microscopic molecular assembly, its number ranges from a few atoms, that is, a molecule to a million atoms, and is bound to each other spherically with a radius of less than 100nm. Nanoparticles stick only to the biological molecules (DNA), proteins or the other biological molecules in the body, and do not stick to the other molecules, which is why they were used in the rapid detection of the blood cell, bacteria, protein, and DNA tests, for example, by taking a blood drop, and testing it within minutes[3].

Silver nitrate is uses in the fields of medicine and industry [4] as Doctors use it to treat the wounds

resulted from fire to prevent the bleeding or the infection and It is used to remove the warts, and the small tumors and used as a cool neutral solution of the silver nitrate to treat some of the eyes, and skin diseases, as the eyes of newborn babies are treated to prevent the possible blindness and It is used to sterilize the deep wounds and used in the photography, such as making movies and used in the manufacture of mirrors, and the ink that cannot be removed and used to draw tattoos on the skin [5].

2-Preparing Tablets from The Substance of $AgNo_3$

A tablet from the $AgNo_3$ nanoparticle, was prepared, and (2.7) gm of the powder was taken. The process of pressing was conducted by using the hydraulic electrical piston, and a metal circular mold and by compressing of 16KN for a period of (2.5) minutes. The sample resulted from the process of pressing was in the form of a tablet with a diameter of (10) mm, and a thickness of (10) mm in the metal mold, and it is preferred to use the powder immediately after pressing it, to reduce the size of the air gaps located within the same mold.

The topography of the prepared sample surface was studied by using the atomic force microscope that origin Japan and consists of a needle with a microscopic dimension that passes the studied surface.

The optical measurements were carried out in the study by measuring the Absorption of the prepared nanoparticle sample , and the UV Visible Spectrophotometer that origin Japan with two bands was used for the range of (200-1100) nm range .

3- Results and Discussion

Atomic force microscopy was used to study the topography of the surface of the sample prepared by ($AgNO_3$),. Fig (1) shows image of the studied sample, showing the surface roughness, root Squared rate, and the rate diameter granular of the surface and the values of above as follow:

Image size = 1513.49 nm × 1527.50 nm
Amplitude parameters :
Sa(Roughness Average)= 27.6 nm
Sq(Root Mean Square) = 31.8 nm
SsK (Surface Skewness) = 0.0062
Sku (Surface Kurtosis)= 1.8
Sy (Peak –Peak) =110nm
Sz (Ten Point Height) =110nm
Hybird Parmeters:
Ssc (Mean Summit Curvature) = - 0.112 (1/nm)
Sdq (Root Mean Square Slope) =3.05 (1/nm)
Sdr (Surface Area Ratio) = 309

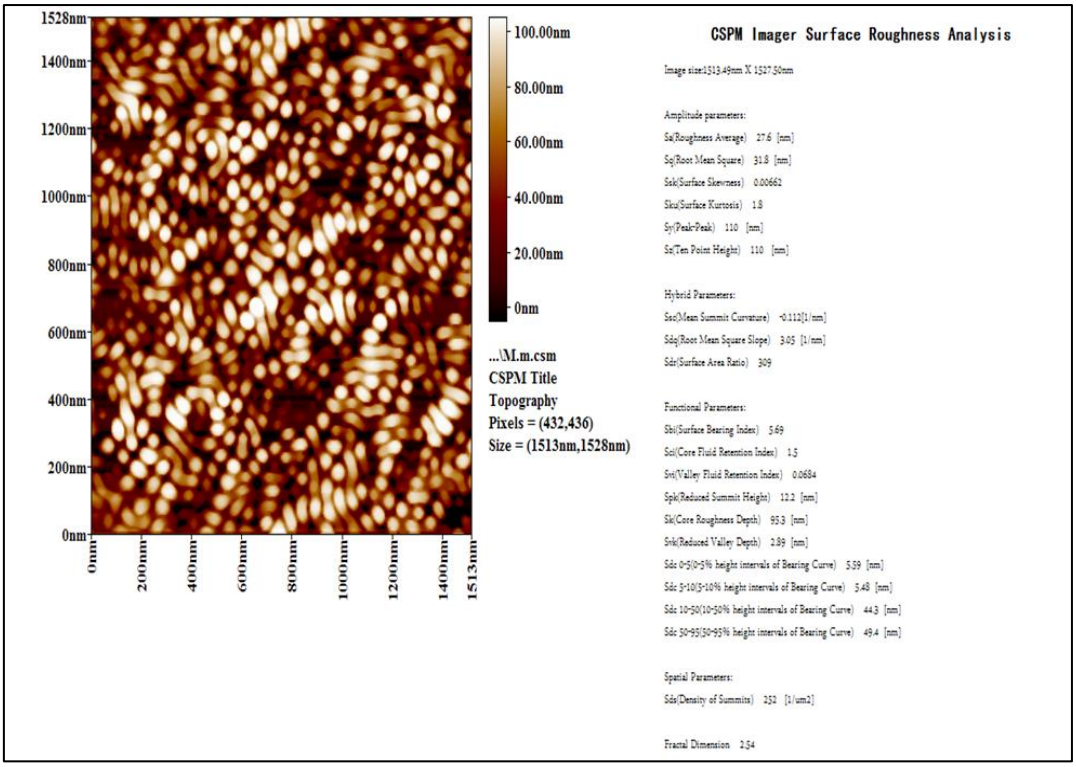

Fig. 1: two-dimensional image (2D) of $AgNo_3$ sample ,white point = Ag, black point =NO_3 .

As for Figure (2), show image the total topography of the surface, and shows the structural appearance of the granules formed on the surface. Through this image, we note on surface smoothing obtained the value of the surface thickness of the sample, as the Z axis represents the surface thickness equal 104.76nm , that means, we have the highest peak of the crystal granules on the surface whenever the compressing on the sample increased while pressing, this confirms that regularity, and crystalline growth is happened[6], and granulation are approximately evenly distributed, thereby, reducing the imperfections in the sample. and figure (4) represents a graph of the granular groups distribution percentages on the surface of the

pressed $AgNo_3$ when 40% and 15% of it distribute between diameters (50-70)nm. and table (1) show diameters and volumes for all diameters showing to them and cumulation we note if increase diameters decrease the volumes and increase cumulations.

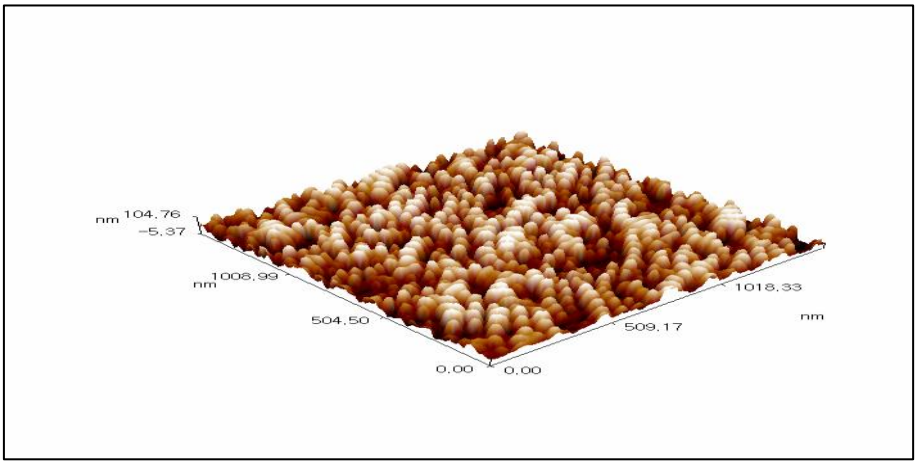

Fig. 3: Represents three-dimensional image (3D) of $AgNo_3$ sample

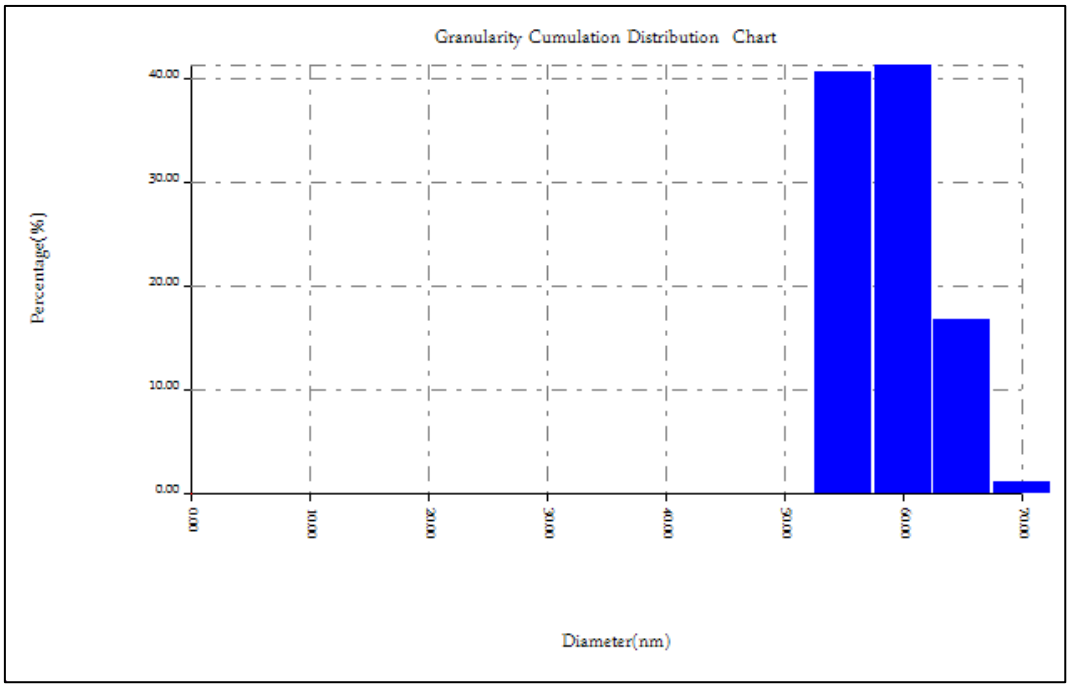

Fig. 4: represents a graph of the granular groups distribution percentages on the surface of the pressed $AgNo_3$ sample.

Table (1): represents the structural characteristics resulted from this test, as these values was listed in the table

Avg. Diameter:56.51 nm **<=10% Diameter:0 nm**
<=50% Diameter:55.00 nm **<=90% Diameter:60.00 nm**

Diameter(nm)	Volume (%)	Cumulation (%)
55.00	40.63	40.63
60.00	41.25	81.88
65.00	16.88	98.75
70.00	1.25	100.00

The optical properties of silver nitrate were studied, including absorbance measurement was conducted within the wavelength range of (260-1100) nm of silver nitrate. we obtained As for Figure (5) shows the change of absorbance, as a function of the wavelength of $AgNO_3$ sample, and it shows that the increase in energy leads to a large increase in the absorbance values, that is, the relationship between the wavelength, and the energy is an inverse relationship, the highest absorbance value at the

wavelength of 301nm, and its value reaches 0.75. We also note that the absorbance decreases when the wavelength increases in the wavelength area of (310-400) nm, then, it is almost stable, and physically, this means that the falling photons could not irritate the electrons to transfer them from the valence bands to the conduction bands, the reason is that the energy of the fallen photons is less than the energy gap value of the studied substance.. The absorbance A and the wavelength λ are inverse, and then approximate stabilize, thereafter[7], for the same reason mentioned above.

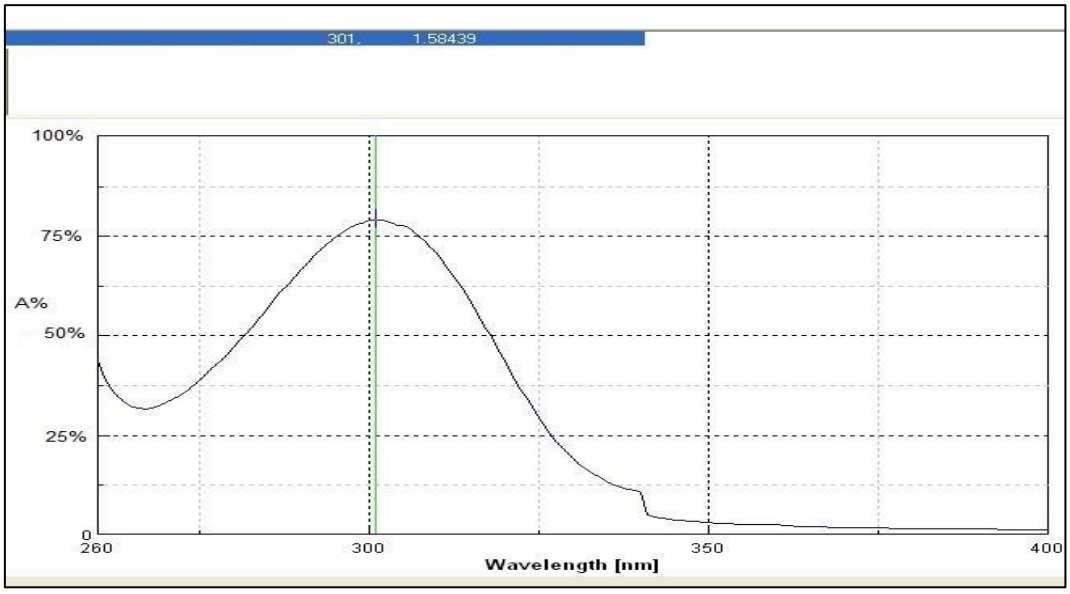

Fig. 5: shows the change of absorbance, as a function of the wavelength of the $AgNO_3$ sample, λ=301nm and A=0.75 .

Conclusions

Through the previous study, we can concluded the following:

1- We when get on the high dimensions of the material studied became the size small and therefore get cumulation ratio great.

2- By studying the optical properties of a silver nanoparticle nitrate solution, we conclude that the wavelength of the substance is little, that is, its energy is high (absorption energy), Therefore, it is used in the field of medical treatments, and deep wounds sterilization but with little ratio for it leads to burning the skin.

3- To increase the efficiency of the silver nitrate compound, it can be converted into a Nano compound by grinding, and pressing.

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دراسة الخواص التركيبية والبصرية لمركب نترات الفضة النانوية

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الملخص

يهدف البحث الى دراسة الخصائص البصرية وطبوغرافية مركب نترات الفضة النانوية المكبوسة ومعرفة مزاياها بعد الكبس.

وعند دراسة طبوغرافية سطح نترات الفضة النانوية من خلال مجهر القوة الذرية AFM ودراسة الخواص البصرية لمحلوله من خلال جهاز الاشعة فوق البنفسجية UV حسب آلية عمل الجهاز حصلنا على اعلى امتصاصية عند الطول الموجي 301nm فقط أي ضمن الطيف المرئي (300-700)nm.

من خلال دراسة الخواص البصرية لمحلول نترات الفضة النانوية استنتجنا ان الطول الموجي للمادة قليل أي إن طاقتها عالية (طاقة الامتصاص) والنفاذية ضئيلة لذلك تستخدم في مجال المعالجات الطبية وتعقيم الجروح العميقة .

ولزيادة كفاءة مركب نترات الفضة يمكن تحويله الى مركب نانوي من خلال طحنه وكبسه.