Synthesis of silver nanoparticles from seed washings and their antibacterial activity

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Abstract

In the recent years metallic nanoparticles have been extensively studied for their use in a number of products due to their chemical, physical and biological properties[1]. Silver nanoparticles have gained special importance due to their uses in the medical sector for wound dressings and surgical equipments, due to their antimicrobial properties[2,3]. This paper presents novel, green and low cost formation of silver nanoparticles and studies on their antibacterial potential[4,5]. The formation of silver nanoparticles is monitored via the change of colour occurring due to the surface plasmon resonance using the UV-Visible spectrometer. The results achieved showed that silver nanoparticles began forming within an hour of the reaction starting and a brown colour of the solution can be appreciated after a few hours. Characteristics of these nanoparticles have been determined via the use of SEM, TEM and X-ray analysis in order to establish the qualitative and quantitative measurements of the particles. The silver nanoparticles formed were of about 20 nm in size and well dispersed; showing capping agents were preventing the nanoparticles from agglomerating. Antibacterial properties have also been investigated using *Bacillus subtilis.* Growth of the bacteria was monitored by the change in turbidity of the nutrient broth by noting absorbance at 600nm using a UV-Visible spectrometer. The effect of the nanoparticles in bacteria was determined via the control of the concentration of the nanoparticles against the turbidity, and therefore growth, of the bacteria. This determined the inhibition of the bacteria when in solution with silver nanoparticles[Fig.5]. In order to determine the effect of the nanoparticles in bacteria, the cells were viewed under the SEM and it was found that dead cells have certain silver particles attached to their body [Fig.6].

References

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Formation and characterization of Silver Nanoparticles (AgNPs)

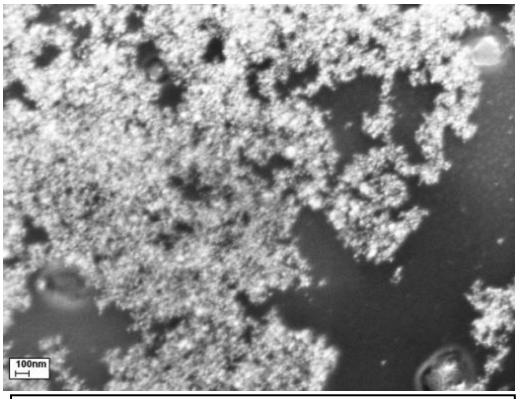

Figure 2: SEM image of AgNPs formed using ***seed F-1*** at magnification of X 100 000.

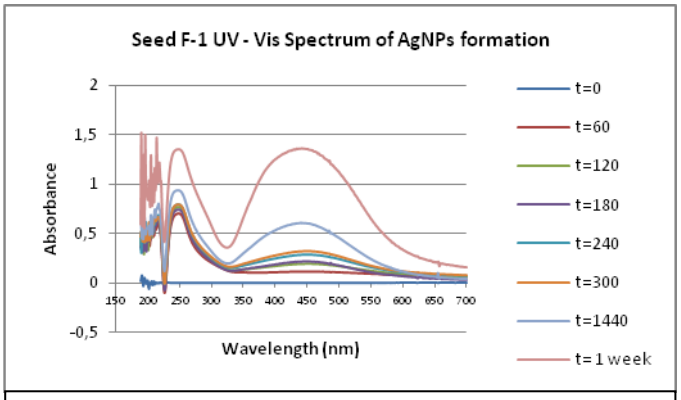

Figure 1: show the UV-visible spectrum of the formation of AgNPs with seed F-1. The absorbance peak is reached at 444 nm for AgNPs.

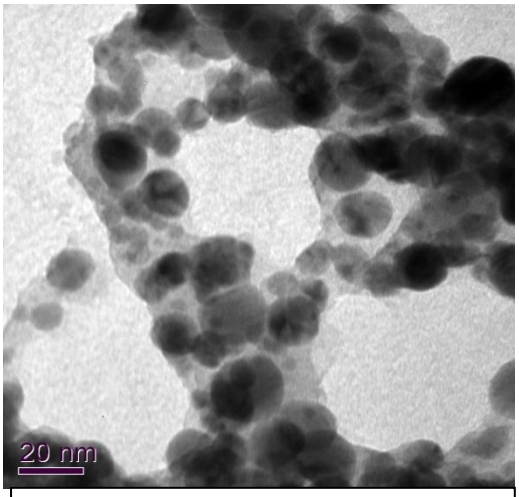

Figure 3: show the JPEG image by TEM for AgNPs with seed F-1.

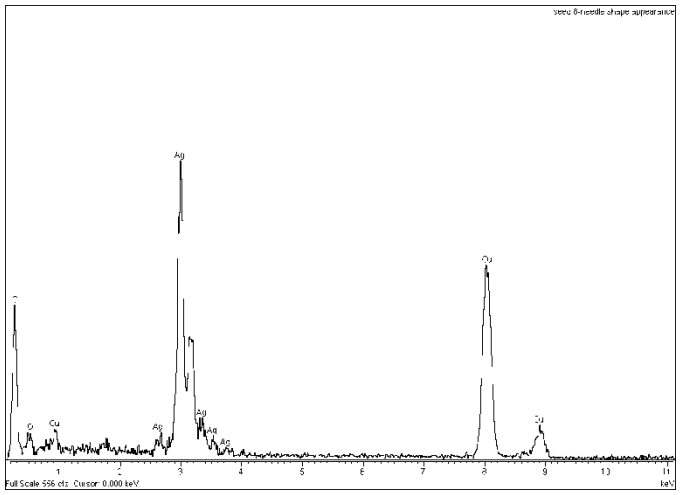

Figure 4: show the X-Ray diffraction confirming the presence of Silver NPs.

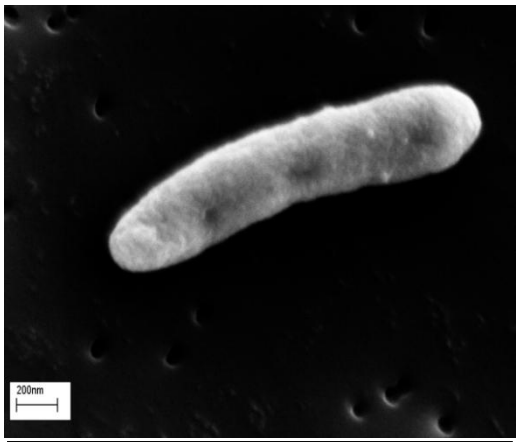

Figure6: show SEM image of *Bacillus in* silver nanoparticles.

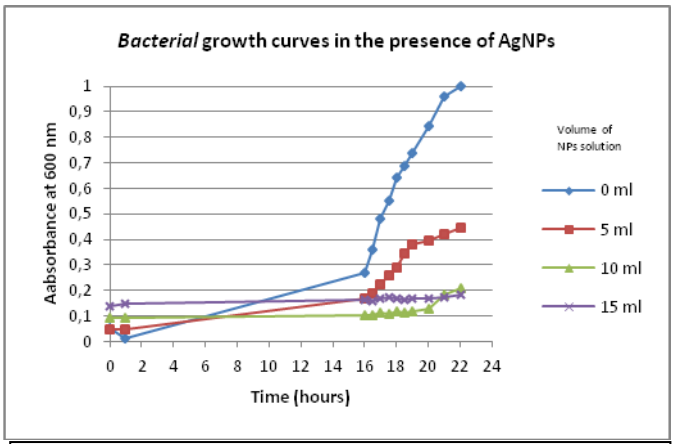

Figure5: show the UV-visible spectrum of the growth of *Bacillus subtilis* in nutrient broth with increasing concentrations of silver nanoparticles.