Biosynthesis of Silver Nanoparticles and its Application in the Removal of Mercury (II) from Water

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Abstract

The synthesis of nanoparticle using chemical sources is gradually being replaced by bio-synthesized nanoparticle to alleviate environmental concerns posed by chemically synthesized nanoparticle. Biosynthesized nanoparticle continues to gain prominence in various applications including water treatment. This study is aimed at exploiting the amalgam relationship between mercury and silver to remove mercury from water samples. Local plant leaves; Aloe vera and Basil are utilized in synthesizing nanoparticles. They both showed silver nitrate reduction capabilities to form silver nanoparticles which were confirmed by UV-Visible analysis. The biosynthesized nanoparticles were characterized using Scanning Electron Microscopy (SEM) and X-ray Diffraction (XRD). Mercury removal was further carried out using porous membranes functionalized silver nanoparticle membrane filter and the analysis of mercury was performed using cold vapour atomic fluorescence spectroscopy.

References

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Figures

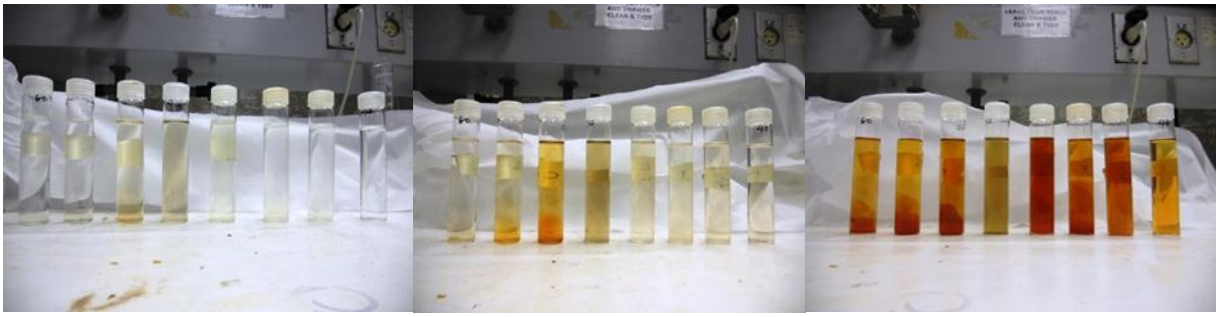


Figure 2: From left to right, Mixture of silver nitrate and plant extract at 0, 15 and 30 minutes respectively.

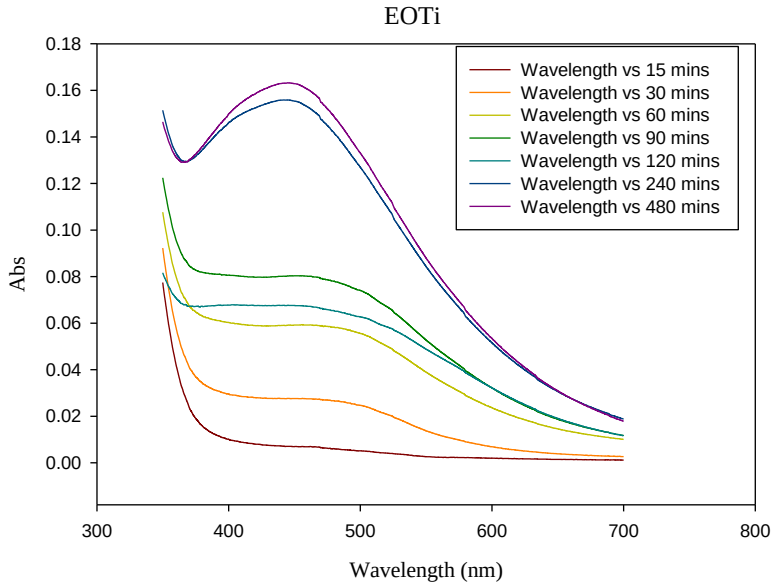


Figure 3: UV- visible spectra of effect of time on the formation of nanoparticles

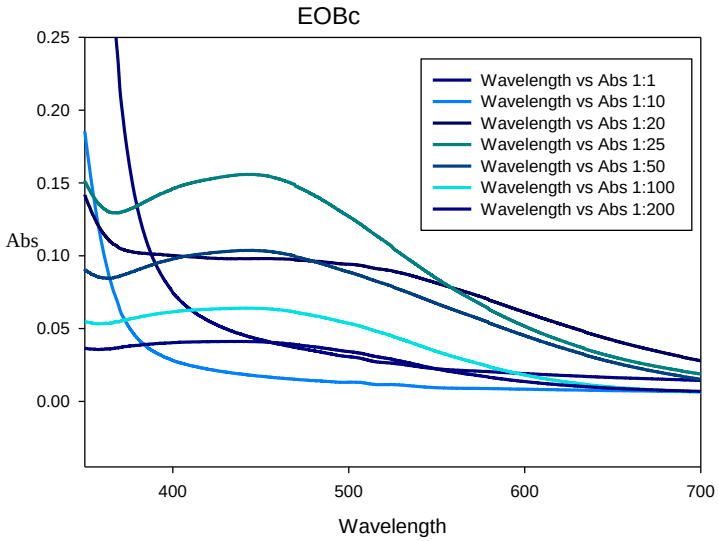


Figure 4: UV – Visible spectra of effect of broth concentration on formation of AgNP

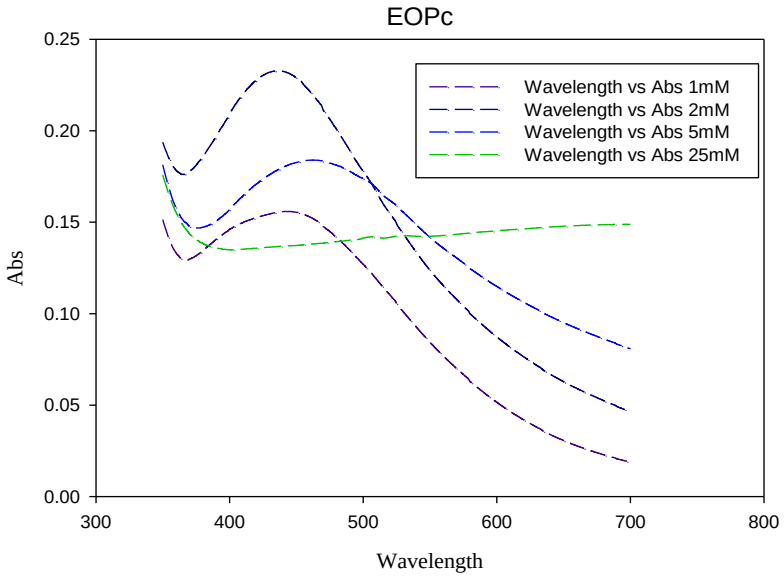


Figure 5: UV- visible spectrum of the effect of different precursor concentration on nanoparticles formed.

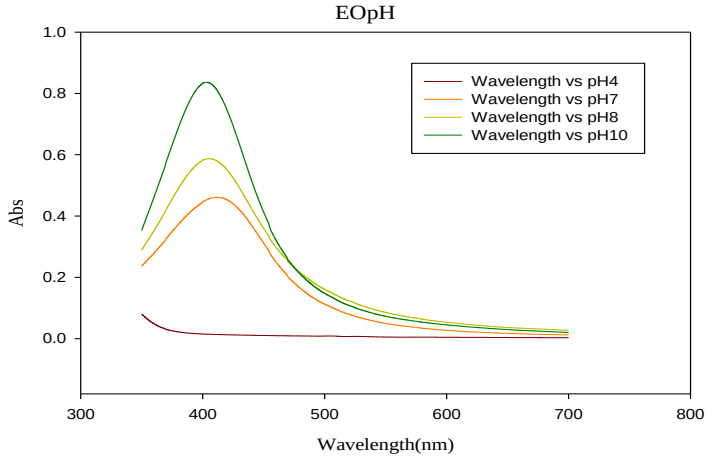


Figure 7: Effect of pH on formation of AgNP

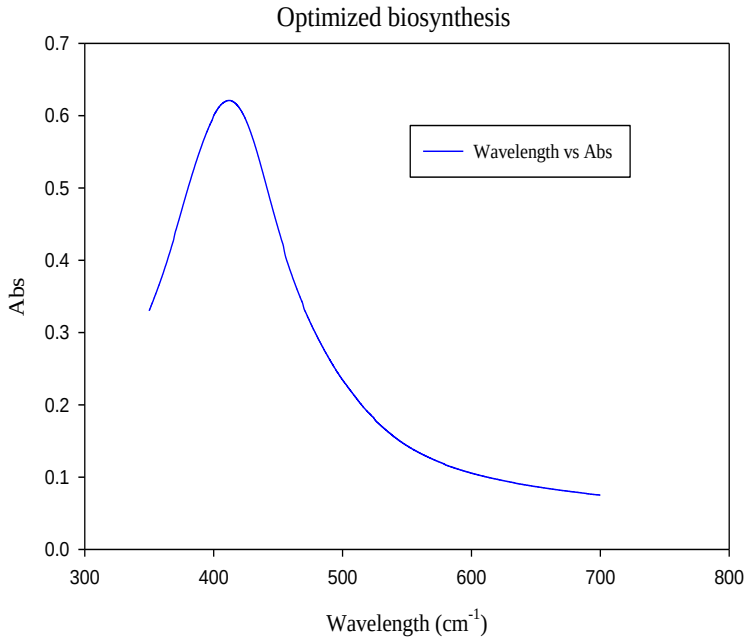


Figure 8: Biosynthesized AgNP at 2mM, 25^{o}C, 1:25 broth concentration, 20 minutes and pH 10

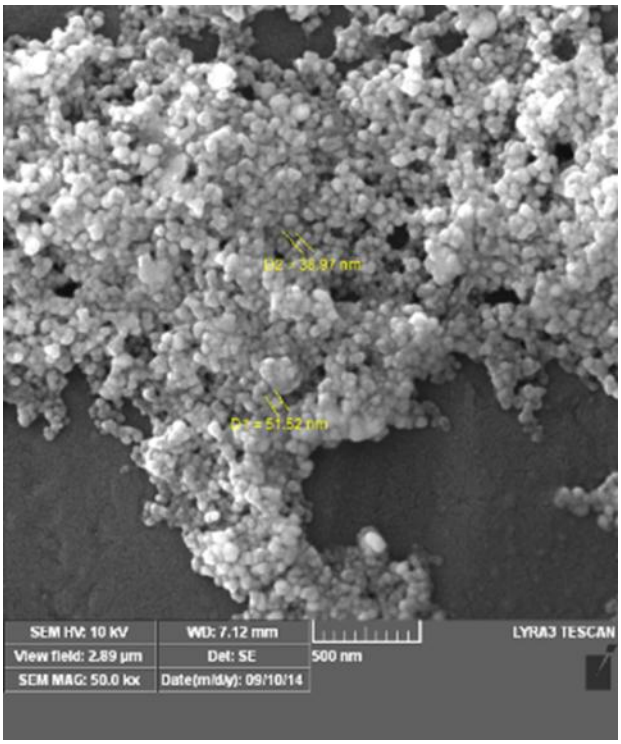
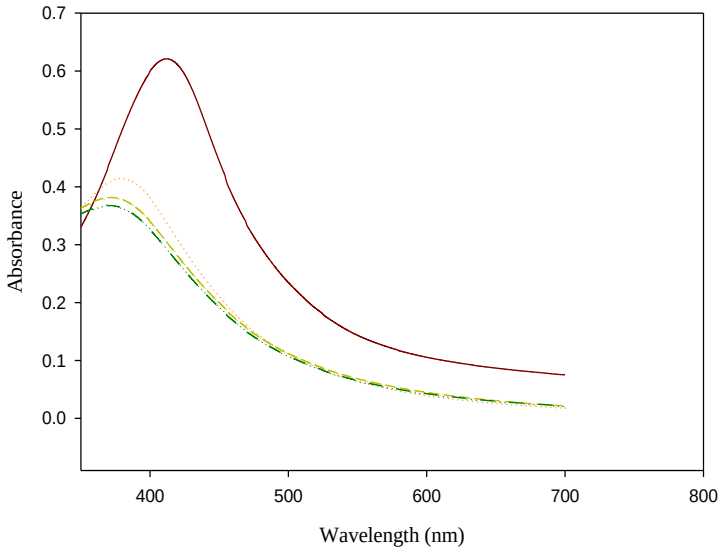
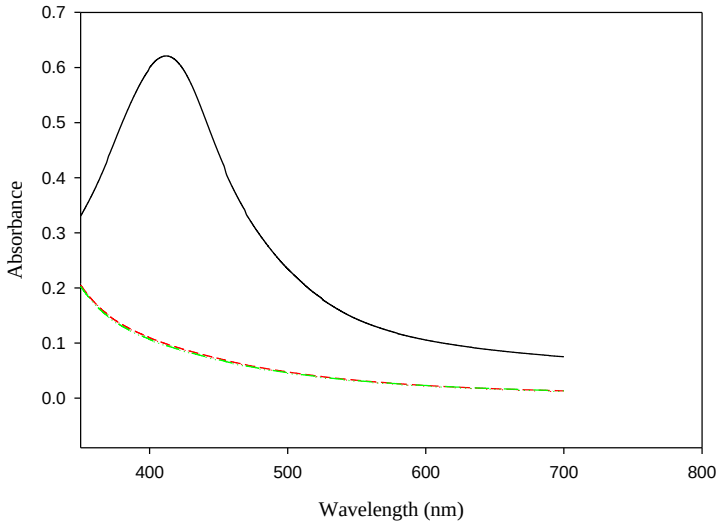


Figure 10: SEM image of biosynthesized AgNP



Wavelength vs abs of pure AgNP in DI water
Wavelength vs abs of AgNP in 100ppm Hg^{2+} at t=0
Wavelength vs abs of AgNP in 100ppm Hg2+ at t=6 hours
Wavelength vs abs of AgNP in 100ppm Hg2+ at t= 24 hours

Figure 11: Reaction of AgNP and 10 ppm mercury solution



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Wavelength vs abs of AgNP in 100ppm Hg2+ at t=24 hours

Figure 12: Reaction of AgNP with 100pm mercury solution