Characterization and synthesis of silver nanoparticles embedded in P Ani-PMo 12 Nanocomposites

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Abstract. Silver Nanocomposite was developed by the simple precipitation method. The X-ray diffraction, scanning electron microscopy, transmission electron microscopy, ultra-violet spectroscopy and dielectric studies were employed the properties of crystalline, morphological and optical properties of the synthesized samples were studied. The aid of X-ray diffraction was calculated the average grain size of silver nanocomposites. The scanning electron microscopy and transmission electron microscopy analysis were determined the surface morphology and particle size. UV absorption spectrum was studied the optical properties of silver nanocomposites and at different frequencies and the silver nanocomposites were observed.

Keywords: Ag, Nanoparticles, XRD, SEM, TEM and Dielectric.

1. Introduction

Polymer /metal nanocomposites are lesser in weight when compared with metals and as a result of their multi functionality. There is a blooming scope for it. To merge, the dispersion of metal nanoparticles into polymer matrix was carried out as a result of which nanocomposites could be prepared. These novel nonmaterials are utilised in biotechnology. Due to its stable dissipation and wide range of application, the metals are frequently studies and it comprises of gold, silver, copper and platinum. The upgrading its increased dissipation and [5] stability in liquid polymer of micro plasma treated nanoparticles. For developing new materials and functionalities, dissipation of nanoparticles into liquids provides lots of opportunities for a wide variety of applications. As a result of polymer nanocomposites [9] capacitors, organic-inorganic nanostructures polymers are being closely observed [1-3]. Presently [9] in fields [4,5] seek a huge attention in high value by hybrid nanocomposites. [9]Hybrid nanocomposites showcases
wonderful conductivity and mechanical properties and their high surface-to-volume ratio adds enhances them further. The metal nanoparticles incorporated into conducting polymer which leads to enhance the efficiency of both the host and the guest [6]. As a result of incorporation of nanoparticles [7] which results in increase in conductivity of polymer, as a result of which found. Also they have applications in several areas and super-capacitors. Before affecting the chemical reactions selectivity, the environment around the metal is supervised by these polymers. The analysation which is employed currently [1] amalgams and the characterization of the formed composites.

2. Experimental Procedure

The aqueous solution of phosphomolybdic acid (H$_3$[PMo12O$_{40}$], noted as PMo12) [1] was dissipated into a solution of aniline monomer. As a result formation of polyoxomolybdic a rich colour appearance prolonged which demonstrated. A 10mm aqueous of Agno$_3$ was added to the solution which was then ultrasonicated for 10min which was then allowed to stand for 24h. The XRD pattern [11] was obtained after filtering, washing, drying in vacuum as prepared sample(Ag-PAni-PMo12) . H-800 TEM (hitachi japan) was used for JEOLJSM-67001 scanning electron microscopy [8] transmission electron microscope image was obtained with a rating voltage of 100kV in the range of400-1100nm. A variant carry 5E spectrometer was used to obtain the UV-Vis absorption spectrum. At a range of 50HZ-5MHZ A HIOKI 3532-50 LCR HITESTER was used to analyze the dielectric properties of nanocomposites.

3. Results and Discussion

The scherrer formula was used to calculate the average [3] grain size (D) [14] being the X-ray wavelength, the Bragg diffraction angle and β the FWHM of the XRD peak appearing at the diffraction angle. It is determined average grain size Ag-PAni-PMo12 nanocomposites and it was found to be about 14 nm

![Figure 1. XRD pattern of Ag-PAni-PMo12](image-url)
The XRD and morphology of Ag-PAni-PMo12 nanocomposites is shown in Figure 1 and Figure 2. It is clearly seen that the samples have spherical shapes of Ag nanoparticles as shown in Figure 2 and Figure 3. The polymer helped to be divided size of the particle was found to be 28nm.

**Figure 2.** SEM image of Ag-PAni-PMo12

**Figure 3.** TEM Image of Ag-PAni-PMo12
Figure 4. UV Spectrum of Ag-P Ani-PMo12

UV-Vis is inferred from result that an absorption peak was centred at approximately 450nm. The sample consumed was the one with the smallest size due to quantum confinement effect is observed the blue-shift in the existing figure. The inset of Figure 5 describes a plot of versus for the Ag-PAni-PMo12 nanocomposites. The fig5 exhibits 2.7 eV band gap value.

Figure 5. Plot of $(ahv)^2$ Vs photon energy
The frequency reliance [10] temperature by Figure 6 and Figure 7 are observed identical nature is shown [4] both the dielectric constant and loss. The contribution of the frequencies [15] is dependent dielectric constant of the on material at low frequencies. The space charge polarization process is normally helped by lower frequencies and a high temperature [2] is accounted by the increasing frequency of low value of dielectric constant. [19]The gathering of the grain boundaries values at low frequencies is achieved the dielectric constant decreases with increase in frequency. The dielectric loss is indicated the energy in the dielectric system. [17]At different temperatures the variation of dielectric loss in Figure 7 has been identified decreases attains [2] at temperature analysis depicts the dielectric loss falls abruptly. It is observed for all temperature with the increase in frequencies. The ac conductivity of the Ag-PAni-PMo12 nanocomposites [19] is the permittivity in free space, the dielectric constant, the frequency and the loss factor. Electrical conduction Ag-PAni-PMo12 nanocomposites appear in the metal ions [2] that AC conductivity for all temperatures the increase in frequency. It is observed that ac conductivity gradually increases [2] the electron hopping frequency increases with increase in the frequency of the applied ac filed.

![Figure 6. Dielectric Constant with log frequency](image-url)
Figure 7. Dielectric loss with log frequency

Figure 8. Variation of conductivity with frequency
4. Conclusion

The synthesize nanostructure that incorporate the nanoparticles paved path for nanoparticles clusters increases conductivity of polymer which has led to its diversified application in field of electronics. These composites have also found its application in coatings. The control selectivity of the chemical reactions by the Ag-PAni-PMo12 nanocomposites [6] was synthesized as simple chemical precipitation method. The XRD pattern is confirmed the cubic synthesized Ag-PAni-PMo12 structure. The [8] scanning electron microscopy analysis is shown the nanoparticles agglomerated forming spherical shaped particles. It is clearly confirmed the formation of nanosize particles from transmission electron microscopy [5] with an average particle size of 28nm. UV-Visible absorption spectrum is used to study the optical [8] properties. The optical band gap was 2.7eV and the variation of the dielectric constant, the dielectric loss and AC conductivity with frequency for Ag-PAni-PMo12 nanocomposites were studied. The [3] dielectric studies revealed that an increase in frequency both the dielectric constant and loss decreased. With an increase in the temperature and frequency of AC electrical conductivity [10] was also increased.

5. References

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