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Synthesis and Characterization of Polystyrene (PS)/Copper Oxide CuO Nanocomposites

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ABSTRACT

In this work, copper oxide (CuO) nanoparticles were synthesized via the sol-gel process (soft chemistry). On the other hand, Polystyrene (PS) nanocomposites loaded with copper oxide (CuO) have been carried out using the solution mixing method. The effect of CuO nanoparticles on the properties of Polystyrene (PS) has been studied using a number of techniques: X-ray diffraction (XRD), Fourier transform infrared (FT-IR) and UV-Vis spectroscopy.

Introduction

Polymers are used in several sectors of human activity due to their properties and easy processing. On the other hand, nanoparticles have several advantages related to their large specific surface area. To take advantage of these two materials, the researchers thought of mixing them to take advantage of their advantages by erasing the defects. It was the birth of nanocomposites.

Experimental

Nanocomposite films loaded with different weights (5.10, 15 and 20%) of CuO nanoparticles were obtained after evaporation of the solvent. Films were deposited using spin coating.

Results and Discussion

From the analysis of the XRD Figure-1, it is observed that the average size of the CuO crystallites used in the PS / CuO nanocomposites is approximately 36 nm [1]. The results of FT-IR spectroscopy as shown in figure-2 confirm the existence of the CuO phase in the Polystyrene (PS) matrix. UV-Visible spectroscopy shows a decrease in the optical gap energy of nanocomposites [2]. In addition, it shows a significant shift in the energy of the band gap of CuO towards the blue which is attributed to the quantum confinement effect exerted by the nanocrystals.



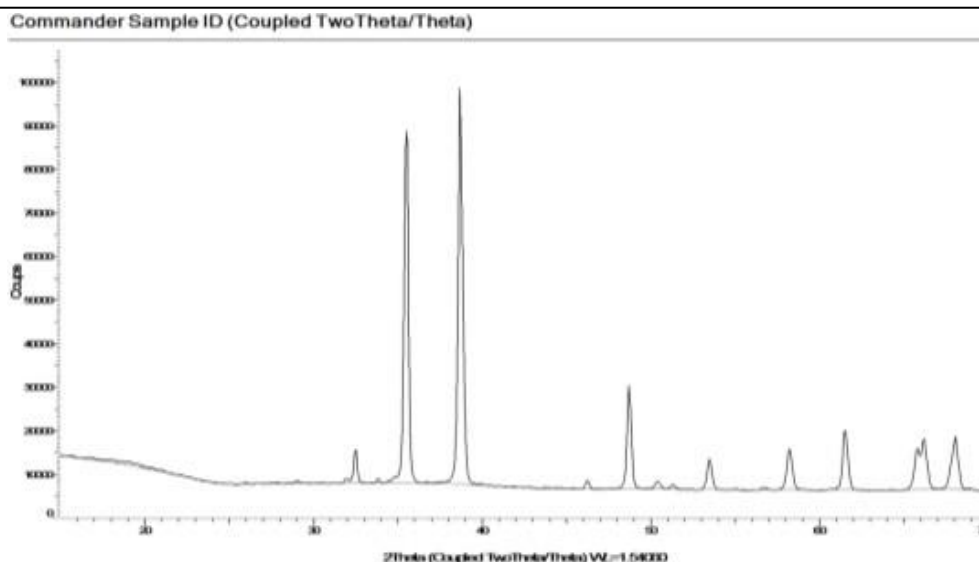


Figure-1: XRD pattern of CuO nanoparticles

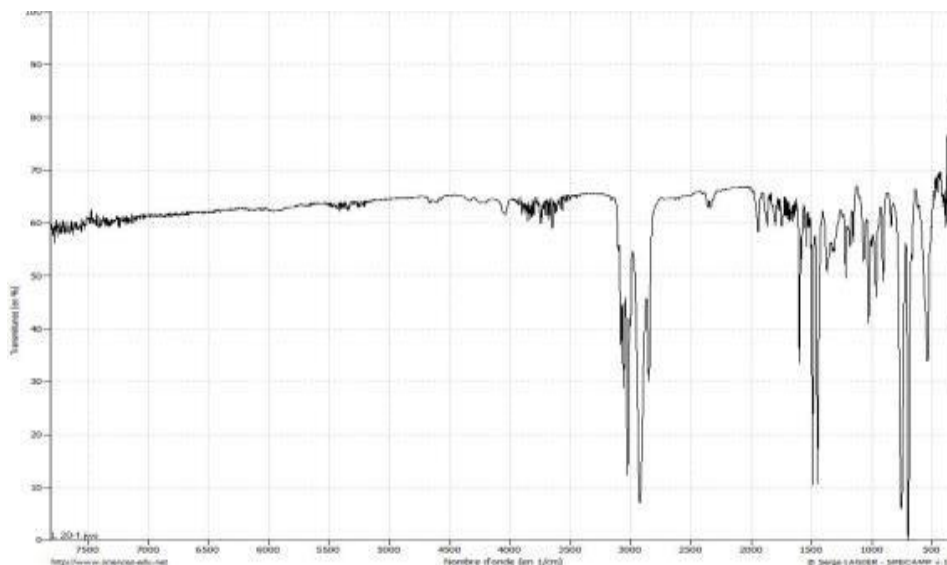


Figure-2: FT-IR spectrum of PS/CuO nanocomposite

Conclusion

The dispersion of these nanoparticles synthesized in a polymeric polysulfone matrix shows good dispersion and good homogeneity at the surface. These nanocomposites can be used in several fields, especially as packaging.

References

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