Structural, optical and magnetic properties of $(\text{Zn}_{0.98}\text{Mn}_{0.02}\text{O})/\text{Graphene}$ nanocomposites

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Zinc oxide with a wide band gap (3.37 eV) at room temperature (RT) and a large excitation binding energy of 60 meV, is an n-type II-VI semiconductor. It is one of the most promising multifunctional materials to be applicable in light emitting diodes, solar cells, room temperature ultraviolet lasers, field effect transistors, gas sensors and piezoelectric-gated diode. It has remarkable properties for electrical and optoelectronics applications [1, 2]. On the other hand, Graphene (G), with one-atom thick layer 2D structure has high optical transparency, chemical stability, good mechanical strength, high thermal and electrical conductivity and large theoretic surface area (over 2600 m² g⁻¹). The graphene sheets overlap with each other to afford a three dimensional conducting network, which facilitates electron transfer between the active materials and the charge collector. In the present investigation structural, optical and magnetic properties of sol gel derived (1-x) $(\text{Zn}_{0.98}\text{Mn}_{0.02}\text{O})\text{xG}$ nanocomposites (with x=0.0, 0.010, 0.020) have been studied using a variety of experimental techniques. XRD showed that there

spectra and on the band gap. It showed that the band gap is independent of the graphene concentrations and it is around 3.37 eV (Figure 2).

Figure 2: Absorbance spectra of $(\text{Zn}_{0.98}\text{Mn}_{0.02}\text{O})\text{xG}$ nanocomposite

The magnetic property study indicates the enhanced magnetization with graphene addition. Magnetization is increasing as we increase the graphene concentration (Figure 3). That may be due to the Zig-Zag edge of graphene edge.

Figure 1: XRD of $(\text{Zn}_{0.98}\text{Mn}_{0.02}\text{O})\text{xG}$ nanocomposites

There was no impurity phase in as prepared samples (Figure 1). Ultra violet visible (UV) measurements have been used to study the effect of graphene concentration on absorption

Figure 3: Room temperature M-H Curves of the $(\text{Zn}_{0.98}\text{Mn}_{0.02}\text{O})\text{xG}$ nanocomposites

References

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