CONCLUSION
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We have studied various phenomenon of photoelectret and its related effect in mixed composite. The comparative study of two synthesized sample (mixed composite) named as MTZ1 and MTZ2 is observed. Various properties like crystallite size (grain diameter), photoconductivity, electroluminescence, photoelectret effect and photo dielectric effect are investigated in both the samples.

The X- ray diffraction (XRD) study of both the samples MTZ1 and MTZ2 offers high-quality information regarding the nature of materials. For both the samples; MTZ1 and MTZ2, the crystallite size calculated for prominent peaks is almost same. The patterns exhibit well defined and sharp peaks which indicate the fine crystallinity of the produced composites. It is also observed from the diffraction patterns (XRD) of samples/composites that intensity of diffraction peaks varies with composition of material or in other words composition of material have an impact on intensity.

The effect of voltage, intensity of illumination and temperature on the photoconductivity of mixed composite of MgTiO$_3$ and ZnO in different composition are studied. The photocurrent-voltage (I-V) curve shows two regions of conduction: for $s<1$, photocurrent shows sub-linear behavior and for $s>1$, photocurrent shows super-linear behavior. The transition in the state of material from sub-linear to super-linear is mainly owed to flow of space charge limited current as well as trap limited charge current within the material. The voltage- current characteristics are in good agreement for both the samples having different compositions of material.

On increasing the temperature, the Fermi levels are shifted towards the middle of the gap. During shifting of Fermi levels, a number of traps were converted into recombination centres. Thus, life time of the electron increases and the photoconductivity is sensitized. The points at which photocurrent increased rapidly, thermal quenching of photocurrent occurs. Thermal quenching of photocurrent may be explicated with the help of Rose Model.

The curves plotted between photocurrent ($I_p$) and intensity ($L$) for both sample MTZ1 and MTZ2 are non-linear in nature having different slopes in different regions; lower and higher intensity of illumination. For lower intensity region, the curve shows sub-linear nature of photocurrent whereas for higher intensity region, it depicts super-linear nature of
photocurrent. The sub-linear ($s < 1$) and super-linear ($s > 2$) behavior of photocurrent may be elucidated with the help of class I and class II states. The comparative study of both the samples MTZ1 and MTZ2 concluded that variation of photocurrent with intensity of illumination depends on the compositions of the material. We can also confer that higher is the concentration of ZnO, large will be the photocurrent produced.

The effect of various parameters like field frequency, wavelength and voltage on electroluminescence in mixed composite is studied. The brightness increases on increasing the wavelength. Spectral response show that hump (peak) is occurs in curve at 5460 Å. It is concluded that the position of peaks are slightly affected by changing the excitation frequency (voltage). We observed that higher is the concentration of ZnO, higher will be the brightness produced.

The variation between $1/B$ and $1/F$ shows a straight line with positive slope at fixed voltage. The charge carriers are accelerated during the –ve cycle which causes excitation of activator atoms. As we increased the frequency, the number of transitions per second increased and hence the light output can be increased. If the input excitation frequency is quite high then output will decrease with increasing frequency.

On comparing both the samples, we can conclude that effect of field on brightness depends on the concentration of ZnO in mixed composite. The luminescence emission process is mainly due to the existence of potential barrier of the Mott-Schottky type where the field is proportional to $\sqrt{V}$. We can conclude that effect of voltage on brightness varies with applied frequency and also depends on the concentration of ZnO in mixed composite.

The variation of photoelectret charge with various parameters like intensity of illumination, wavelength, polarizing time and applied field is investigated. On increasing the applied field, more and more traps are filled which results increase in photoelectret charge. The charges trapped in bulk region have longer time. This is due to reduced probability of their re-ejection by absorption of photon. We can conclude that higher is the applied polarizing field, hefty will be the production of photoelectret charge.

On increasing the polarizing time, more charge carriers are generated resulting quite increase in the trapping probability which further produces more photoelectret charge. We can also conclude that photoelectret charge increases on increasing the intensity of illumination and after a certain value the photoelectret charge saturates and this saturation state depends on the concentration of ZnO in mixed composite. It is due to dynamical
equilibrium which setup among the respective bands and trapping level under persuade of illumination modified Fermi level.

The specific wavelength (4000 Å) at which photoelectret charge is maximum correlated to absorption of photons at near band-edge of dielectric which results generation of free charge carriers into conduction band from valence band and captured in deep traps. It is concluded that photoelectret charge ($Q_{PH}$) is maximum in violet region at nearly (4000 Å). From the above discussion, we can confer that effect of wavelength on photoelectret charge is different in different compositions. It is clear from the comparative study of MTZ1 and MTZ2 that percentage of ZnO in mixed composite affected the formation of photoelectret charge.

The variation of conductance ($G$), capacitance ($C$) and loss factor ($\tan\delta$) respective to field frequency, illumination intensity and temperature are studied. It is observed that in lower frequency region the decrement in capacitance ($C_D$ and $C_I$) is rapid. In the lower frequency region, change in capacitance is due to interfacial or space charge polarization. Space charge is an electrical homogeneity emerging in the material, causes dielectric losses. The space charge produced around the boundaries hampers the movement of charge carriers from one grain to another grain; as a result its conductivity is reduced on increasing the frequency. But in upper frequency region, the formation of space charge is not possible therefore any further increase in frequency, capacitance also increases. Comparative study of sample MTZ1 and MTZ2, suggests that effect of frequency depends on the concentration of ZnO in mixed composite.

It is clear from the above discussion that higher value of conductance; in dark and under illumination ($G_D$ and $G_I$) in higher frequency range is owed to dipolar relaxation effect.

The behavior of loss factor with field frequency within the dielectric may be demonstrated on the basis of space charge formation. It is observed that on increasing the frequency, less and less space charge is produced due to which reduces dielectric loss. Comparative study of samples MTZ1 and MTZ2, suggests that concentration of zinc oxide affected the dielectric loss.

In higher intensity region, on increasing the intensity of illumination, capacitance increases slowly and gradually tends to saturate. This is due to the fact that charges of the
capacitor are accompanied by the relatively fast changes of electrical conductivity which reaches quite rapidly its saturation value with the increasing illumination intensity.

In lower region, conductance increases speedily with increasing intensity of illumination, whereas in higher region of illumination intensity, conductance increases slowly and be likely to saturate. The ac conductivity is in fact a sum of frequency independent dc conductivity and true ac conductivity. When intensity of illumination is increased, large number of charge carriers are generated due to which dc conductivity is increased. Therefore on increasing the intensity of illumination, total conductance may be increased. On comparing sample MTZ1 and MTZ2, we can confer that by introducing large amount of zinc oxide in mixed composite, conductivity may be enhanced.

In lower temperature region, the dark capacitance and photo capacitance decreases on increasing the temperature whereas in higher temperature region, the photo capacitance decreases gradually and tends to saturate while the dark capacitance increases by way of rising temperature. In lower temperature range, the decrement in dark capacitance and photo capacitance may be demonstrated with the help of space charge hypothesis. In accordance with space charge hypothesis, rise in temperature decreases the number of equilibrium charge carriers available for space charge formation which further decreases the capacitance. At first look, the reduction in capacitance with rising temperature is mainly due to reliance of capacitance on some filled traps. On increasing the temperature, de-trapping of carriers takes place at higher rate due to which descend change is occurs in capacitance. An increment in capacitance with temperature credited annihilation and formation of dipoles which further produces considerable space charge polarization. In high space charge polarization, large numbers of photo-generated carrier are produced due to which photo capacitance is enhanced. On comparing both the sample MTZ1 and MTZ2, we can conclude that fall in capacitance depends on the concentration of ZnO in mixed composite.

In lower temperature region, decrement of conductance in both the cases; in dark and under light intensity may be demonstrated with the help of space charge hypothesis. It is clear from the graph that conductance in dark (G_D) is more than the conductance in light (G_I). In lower temperature region, the decrease in conductance with rising temperature is mainly due to reliance of conductance on some filled traps. It is also confer that MTZ1 demonstrate incremental impact on conductance.
The variation of loss factor with temperature may be credited to the role of frequency independent dc conductivity towards the measured loss factor. On comparing both the samples MTZ1 and MTZ2; we can confer that loss factor depends on the concentration of ZnO in mixed composite.

Finally, we may conclude that sample MTZ1 (having large concentration of ZnO in mixed composite) have potential findings in practical applications and better efficiency in comparison to sample MTZ2.