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**Polymers** :The term "polymer" is derived from Greek (poly, which mean "many" and meros, which mean "parts"). The polymers are massive molecules that have molar mass values that range between thousands and millions. Approximately 80% of organic chemical industry has been focused on producing the synthetic polymers, like the textile fibers, plastics, as well as the synthetic rubbers. Polymers are synthesized with the chemical combination of numerous small molecules to a single massive molecule. Tiny molecules which are utilized for the synthesis of the polymers are referred to as the monomers [1].

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# Introduction

Polymeric materials have piqued the interest of technological as well as scientific experts due to their broad range of uses. It is effective in creating new medicinal, industrial, and electrical applications because of its superior mechanical strength, lightweight, and optical characteristics[2]. ZnO is one of the many NP materials. ZnO can be defined as one of the semiconductors with a wide band gap (3.37eV) and a substantial excitation binding energy of 60meV at the of the room, which is considerable higher compared to other materials. It also has high transmittance and good electrical conductivity. Because of its distinctive mix of exceptional chemical, physical, electrical, biological, optical, long-term environmental stability, biocompatibility, cheap cost, and non-toxic qualities, ZnO has piqued attention as a multifunctional inorganic NPs[3].

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Poly (vinyl alcohol) (PVA) is one of the most important polymers available in the form of powders, fibers and film. This is a well-known water soluble polymer, commonly used as warp sizing agents and paper coating agents, adhesives, and films. PVA has recently been the subject of Intensive research because it has many industrial applications and relatively low manufacturing costs [4].

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*Materials Used in the Work(one or two)of the polymer-nanocomposite materials following.*

**1-PVA**

**2-ZnO**

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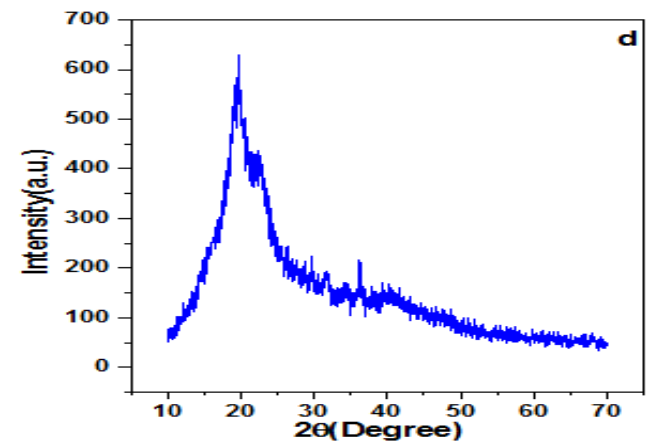
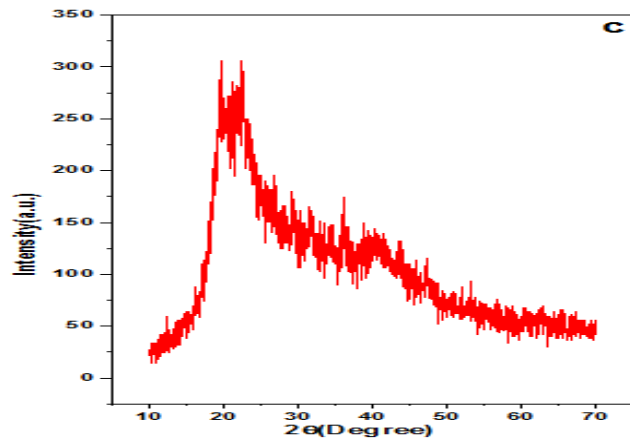
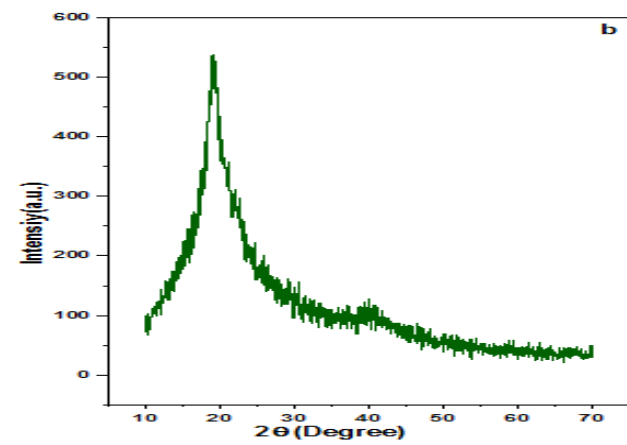
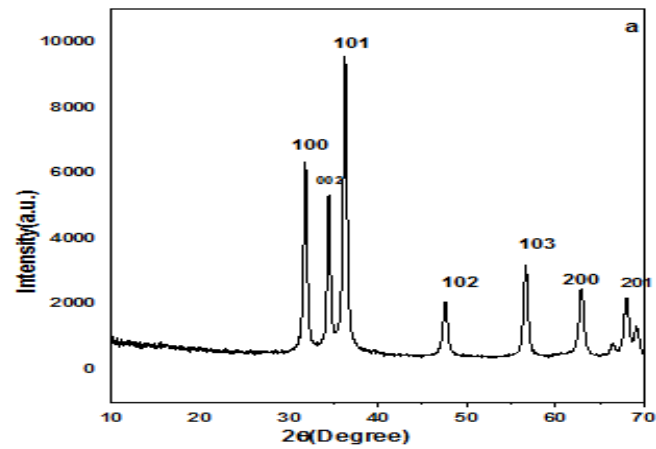


Fig.1. X-ray diffraction spectra of the ZnONPs, pure PVA polymer and PVA/ZnONPs.

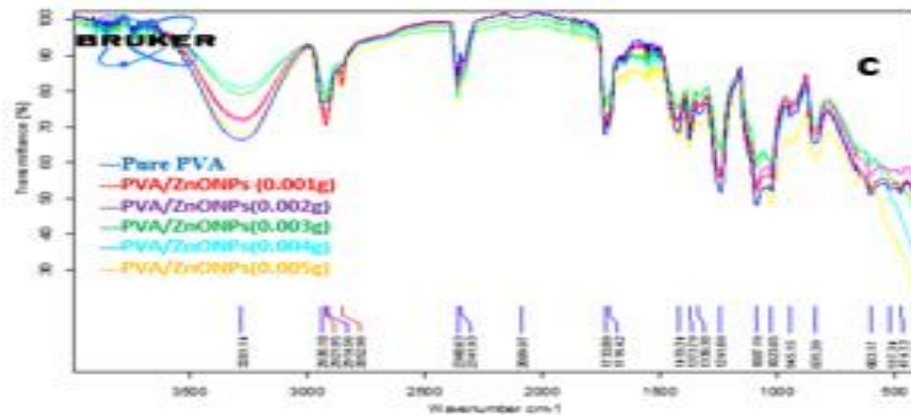
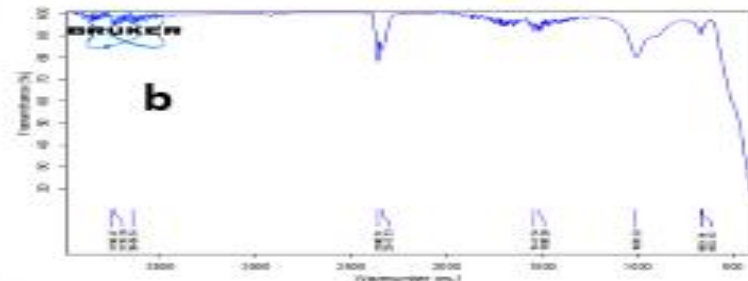
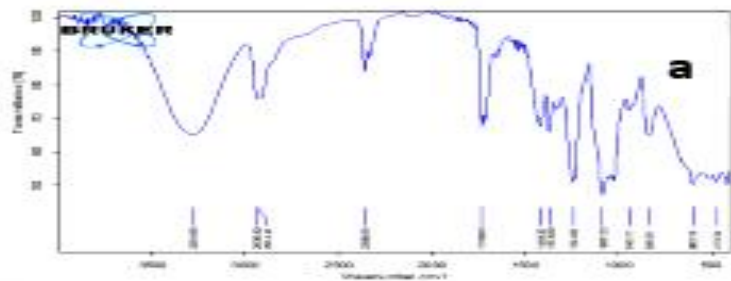
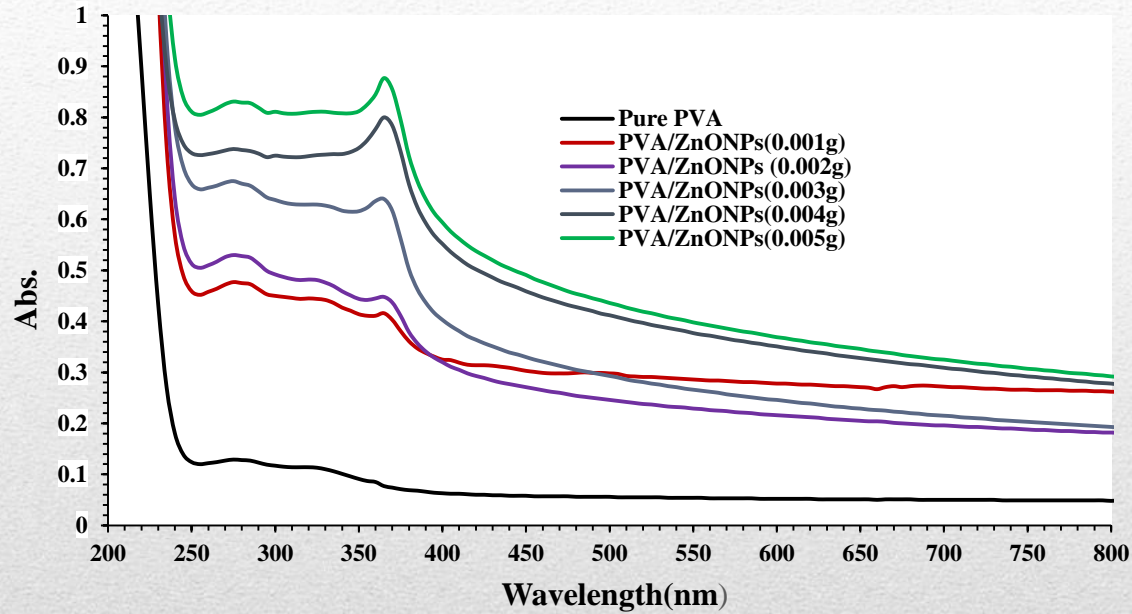


Fig2. FTIR spectrum for a) pure PVA b) pure PVA/ZnO nanoparticles c) PVA/ZnO nanocomposites



**Fig3.** Absorption spectrum of pure PVA and PVA/ZnO nanocomposite films

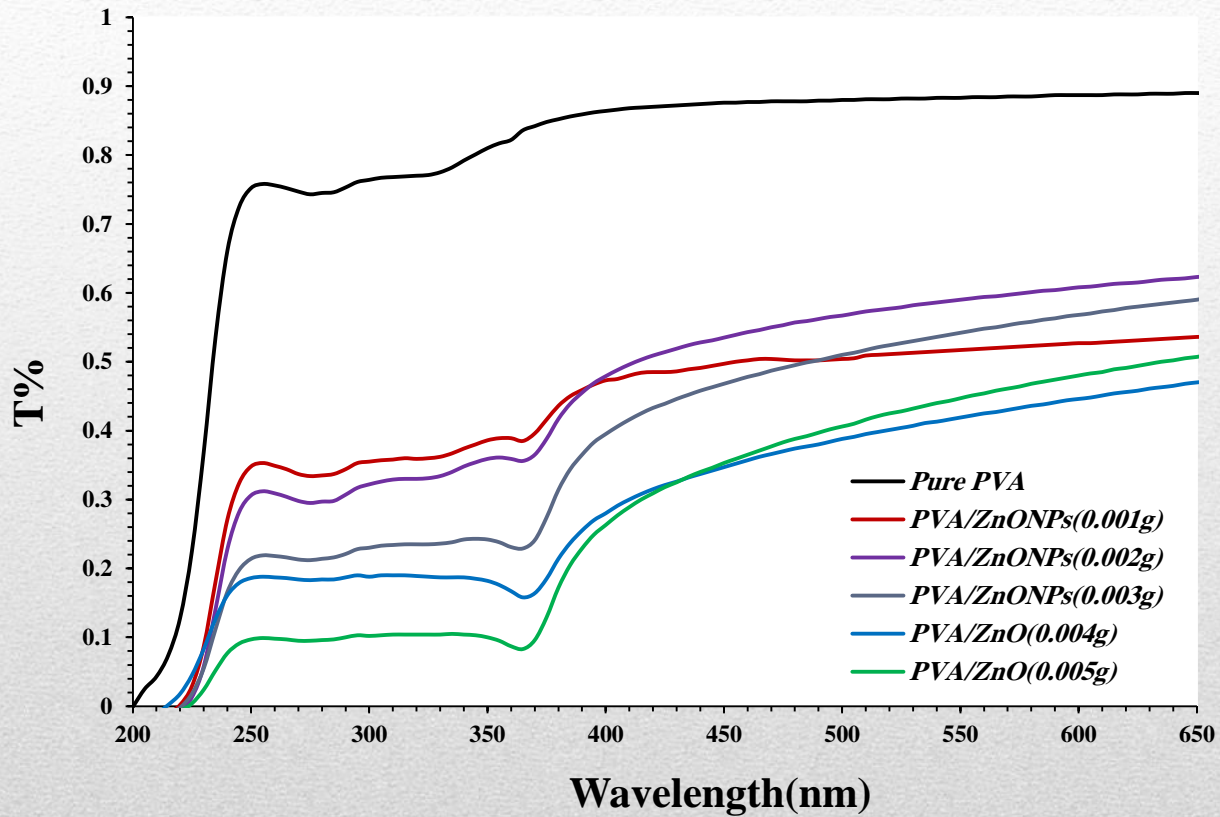


Fig4. Transmission spectrum for PVA/ZnO nanocomposite films.

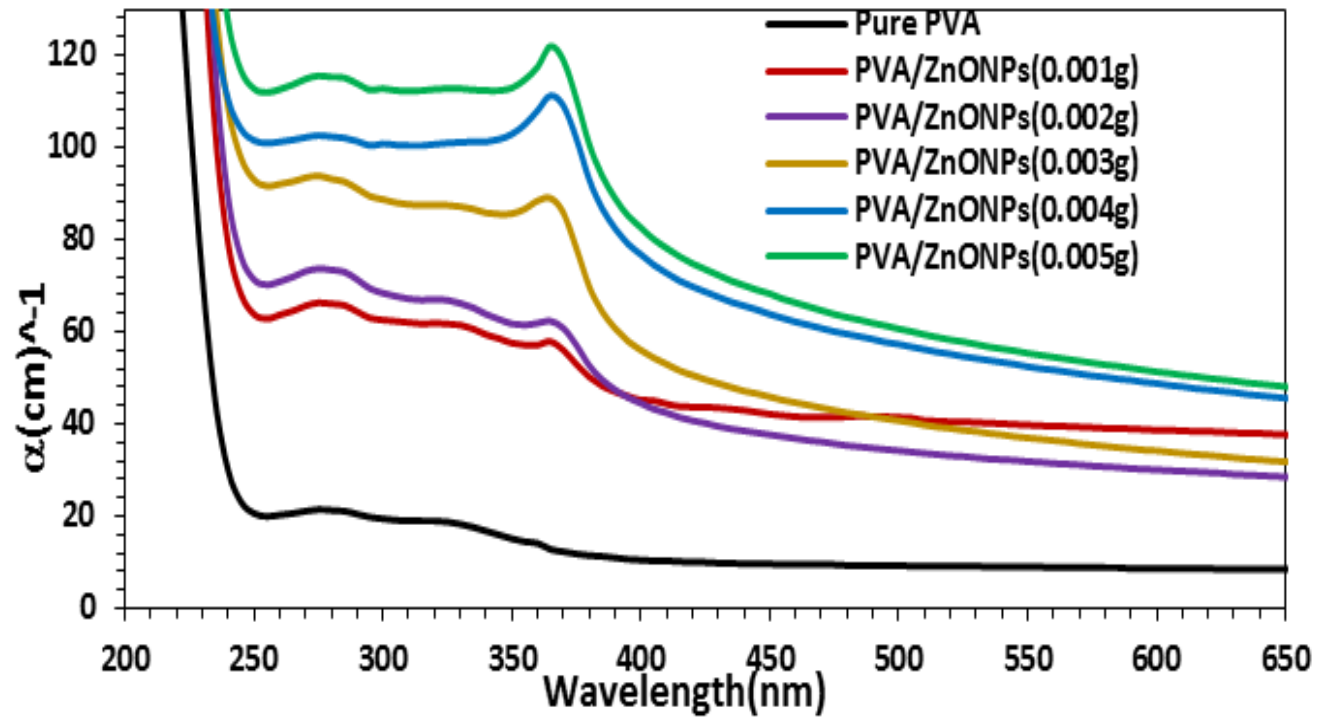


Fig5. Absorption coefficient for PVA/ZnO nanocomposite films.

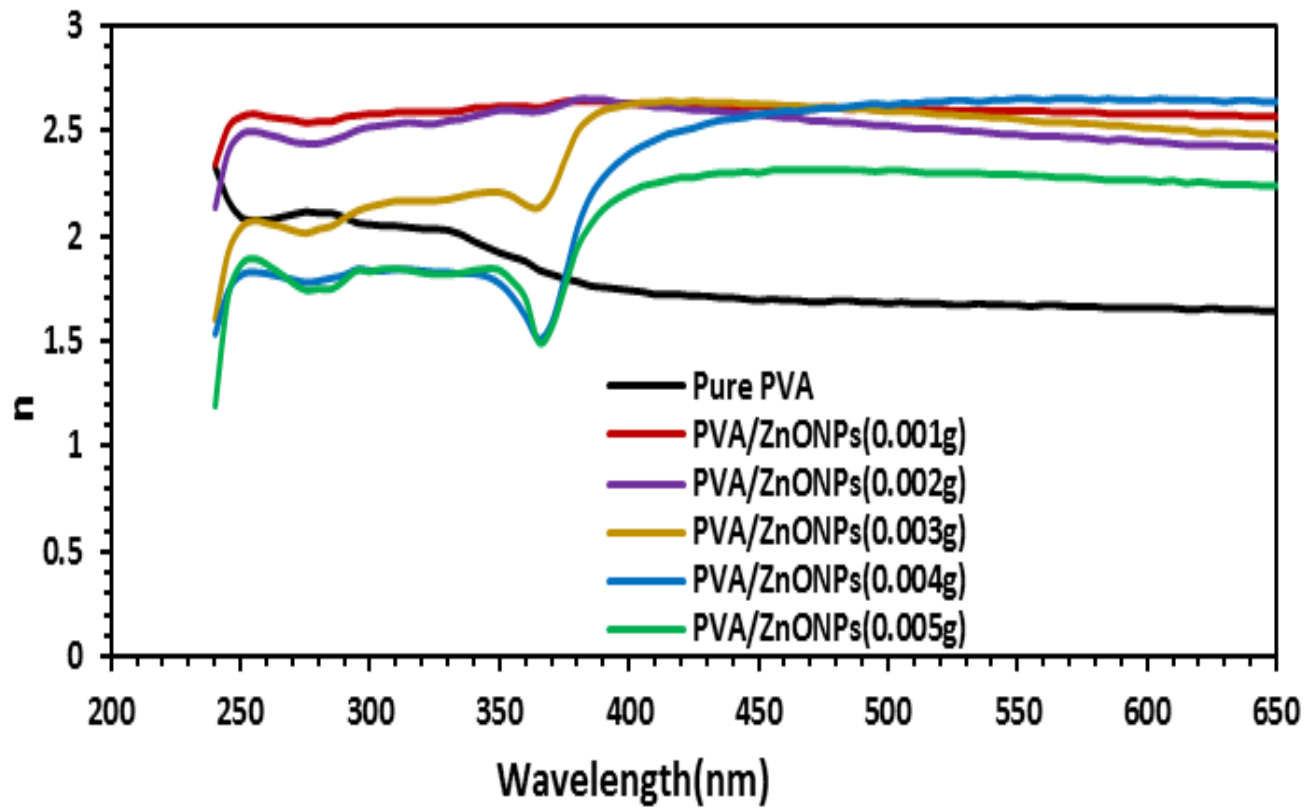
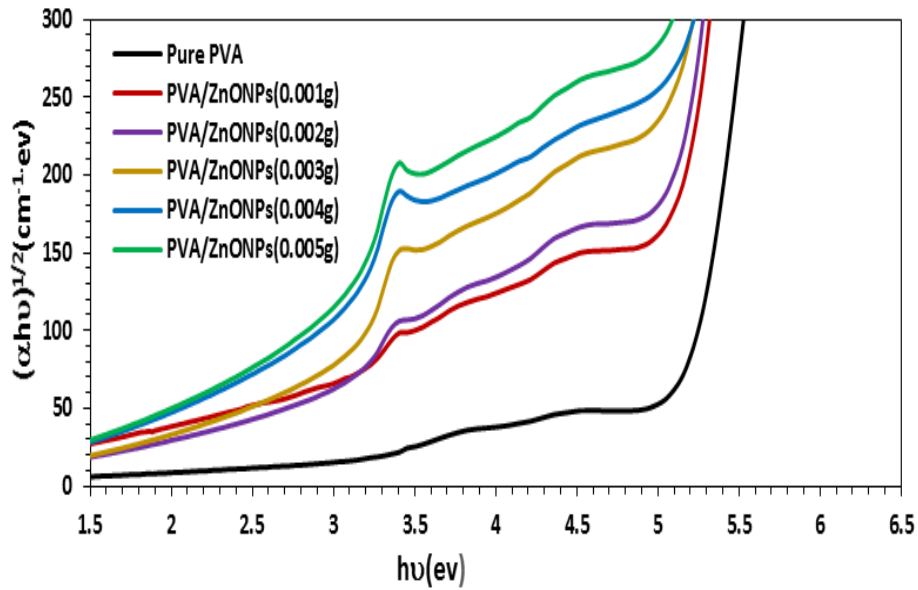


Fig6. Refractive index for PVA/ZnO nanocomposite films.

**Table 1. Energy band gap value to PVC/ZnO nanocomposites**



**Fig7. Optical energy gap for PVA/ZnO nanocomposite films.**

Samples	Energy gap(eV)
Pure PVA	4.92
PVA/ZnONPs(0.001g)	4.83
PVA/ZnONPs(0.002g)	4.74
PVA/ZnONPs(0.003g)	4.65
PVA/ZnONPs(0.004g)	4.56
PVA/ZnONPs (0.005g)	4.47

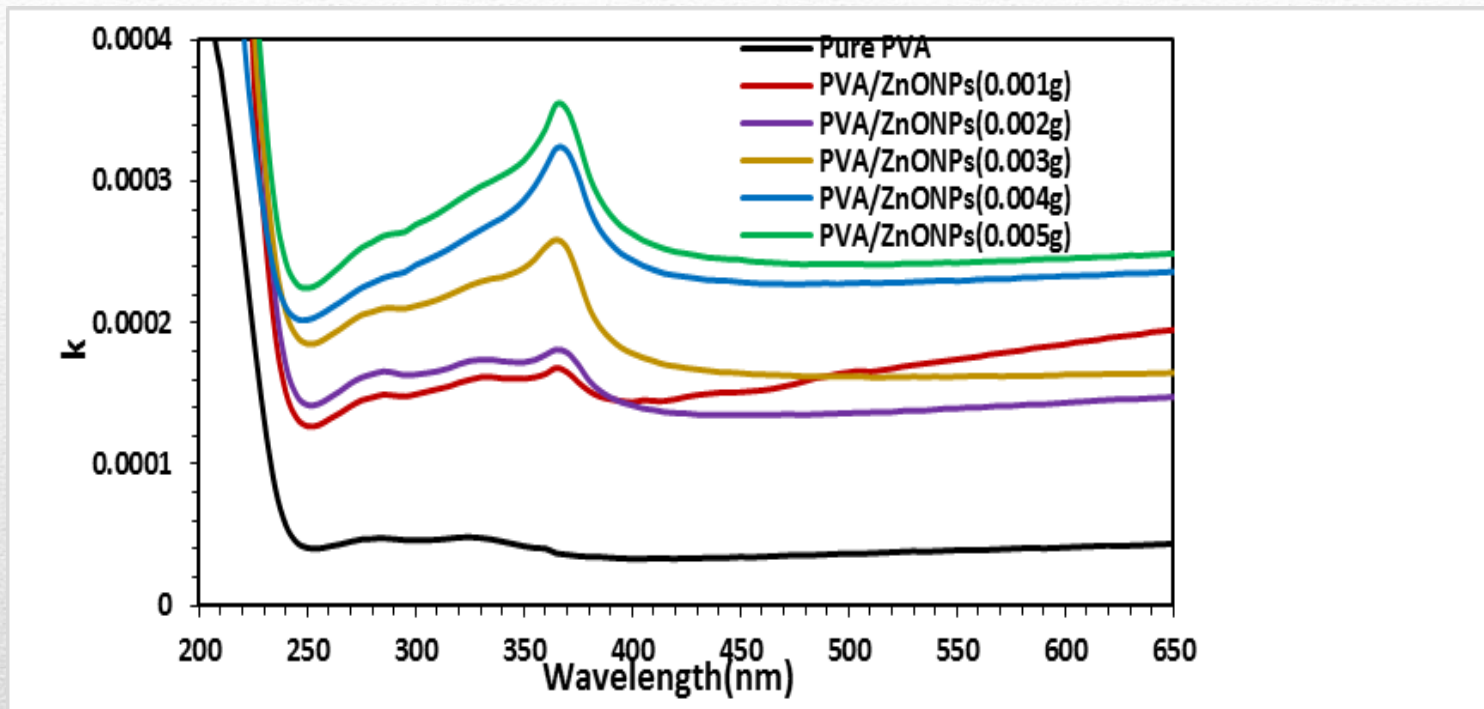


Fig8. Extinction coefficient for PVA/ZnO nano-composite films

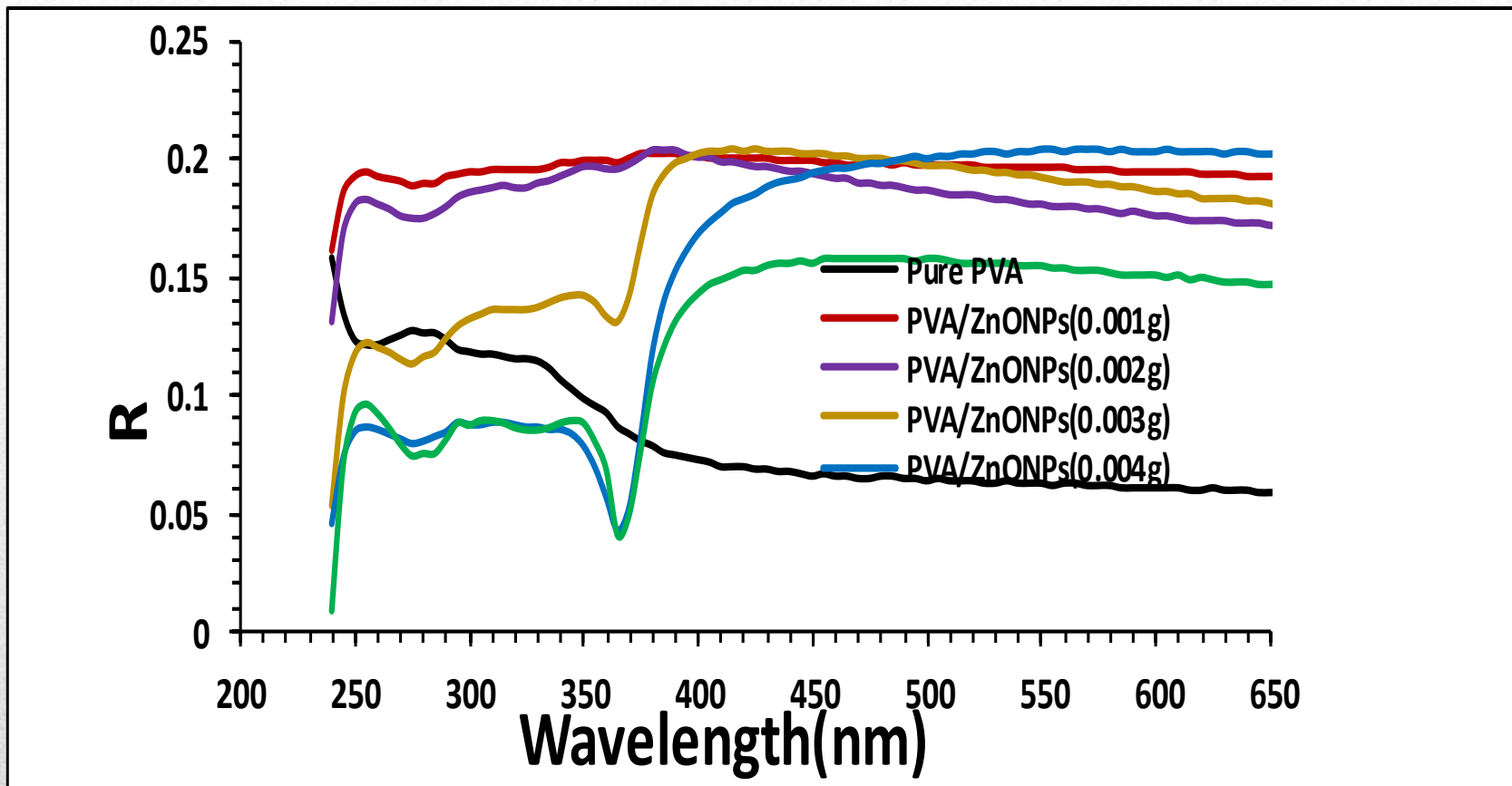


Fig9. Reflection spectrum for PVA/ZnO nanocomposite films

## **Applications of study:**

Prepared polymer composite from (Polyvinyl Alcohol Polymer) with nanomaterial with different doped rates and study physical properties (structural , optical) polymeric composite and investigation from antibacterial activity for this compound.

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  - [2] A.J.Kadham, D. Hassan, N. Mohammad, and A. Hashim, "Fabrication of (polymer blend-magnesium oxide) nanoparticle and studying their optical properties for optoelectronic applications," *Bull. Electr. Eng. Informatics*, vol. 7, no. 1, pp. 28–34, 2018.
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  - [4] T. A. Jassim and A. A. Saeed, "Effect of Gamma Irradiation on the Physical Properties of PVA Polymer," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 928, no. 7, 2020.
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