Chapter one

1.1 Introduction:

For the high secured accuracy of radiation therapy dose that should not exceed ± 5% of the prescribed tumor dose (ICRU, (1976); Zhu, (2000), in addition to the optimum estimation of tissue damage in radiotherapy, radiation protection and researches many dosimetric methods and devices have been introduced such as Monte Carlo for radiation dose calculations (Ding et al 2006, Rogers 2006), Boltzmann Radiation Transport Solvers (Vassiliev et al 2010, Fogliata et al 2011, Han et al 2013), the calculation of dose out the field by Day, (1950) and Day & Aird, (1996), radiographic film, (Tomas et al, 2016; Crosbie et al, 2008), Thermoluminiscence Dosimeter (TLD) (Monti et al, 2004), polymer/Gel dosimeter which composed of normoxic hydroxyl-ethyl-acrylate/Gel (HEA/Gel) (Mohammed et al, 2011-a) and polymer hybridized with nanocomposite metals. These entire endeavors have contributed successfully in radiation dosimetric field. Relative to this study; Abdullah et al, (2017) prepared PVC and PVC/ZnO nanocomposite films by γ-rays irradiation at doses of 20 and 40 KGy that induce color change gradually following the dose increment. And Mohammed et al, (2013), have prepared and studied the response of PVA/$AgNO_3$ films to electron beam irradiation, in which they showed a gradient change of color from colorless to golden and dark golden; indicating different reduction state of silver ions in the composites irradiated with electron beam and receiving doses of 0 – 10 Gy.) which was proposed as radiation detector. Same studies carried out by Mohammed et al,

(2011-b) related to polymer processing by irradiation to prepare conducting polyaniline hydrochloride hosted in polyvinyl alcohol in form of films in which upon γ-irradiation; aniline/PVA changed to polyaniline/PVA nanocomposite with green color as shown in photo

Such effects could be detected and quantified by using different instruments such as: optical densitometer, Ultra-violet-visible spectroscope, IR-spectroscope (optical properties), Raman spectroscope, Infrared spectroscope (chemical effects) in addition to morphological changes by scanning electron microscope (SEM) and transmission electron microscope (TEM). Therefore, these effects could be correlated to the reference exposure dose which in turn could be scheduled and applied as a measuring method for radiation detection or personal exposure dosimeter as highlighted by Slobodan, (2011). The aim of this study will be recon on quantifying the optical density and the absorption coefficient of irradiated films and plotted in graphs versus relevant radiation doses to applicable in rural areas and small towns where the facilities of TLD reader in not available and the economic status is not supporting.

1.2 Problem of the Study:

The lack of iso-dose chart of γ -ray beam therapy which is considered as main problem for the current study as well as the personal detectors in some rural areas clinics.

1.3 Objectives of the study

1.3.1 General objectives:

To prepare polymer composite (PVACu_2O) as a film detector and optimize it in radiation therapy.

1.3.2 Specific Objectives

- To obtain the absorption spectrum of the irradiated film.
- To correlate between the absorption of PVA**Cu_2O** film and dose.
- To correlate between the optical density and the dose.
- To compare between the gradient of optical density and the absorption versus dose.
- To prepare a PVA\Cu_2O film detector.

1.4 Materials and Method:

1.4.1 Materials

- PVA (polyvinyl alcohol)
- CuO_2
- Optical densitometer
- UV spectroscope
- Syringe
- Magnetic stirrer / with control temp (60 – 80 C^o)
- Petri dish
- Sealed black envelope

1.4.2 Method (Technique)

PVA as 5g/500ml of distill water, dissolved under control temp of 80 C^0, with continuous stirring using magnetic stirrer, after obtaining homogenous solution we add 0.1, 0.3, 0.5 g Cu_2O and again stirring for 2 – 3 Hrs.

The solution has been poured in a petri dish as 20ml / each, using Syringe

The petri dish with solution left under ambient temp for water vaporization (dryness). 2 – 3 days the films have been formed in the petri dishes; then peeled off, cut into small pieces 2×2cm, packaged in small envelope, then irradiated with γ-ray, receiving different doses (2,4,6-10Gy). Then the films characterized by using optical densitometer, UV spectroscope and Raman\IR spectroscope to show the induced optical and chemical effects. The collected data will be analyzed by using SPSS in forms of spectrum, correlation and tables.

1.5 Thesis outline

The following thesis will be laid out in five chapters; Chapter one will deals with introduction, problem of the study, objective of the study and thesis out lines. Chapter two will deals with literature review. Chapter three will deals methodology. Chapter four will deals with results, discussion, conclusion and recommendation beside the reference and appendix.