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Characterization of silences acid dosimeter for gamma-radiation dosimetry

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Abstract

Silences acid has been investigated as a dosimeter for high doses of Gamma radiation through measuring the induced changes in optical absorbance from (315-900) nm at room temperature. It was found that the absorbance increased with increasing absorbed Gamma-dose. Also, the dose rate and post irradiation fading of optical absorption spectra has been studied. The results of this preliminary study show that Silences acid may be applied as a simple optical absorbance detector for dose measurement in the dose range (5 - 28) kGy.

Keywords : Gamma-ray, dose-response, dose rate, optical absorption , fading .

خصائص حامض السيلنك لقياس الجرعه الاشعاعية لاشعة كاما

رياض جاسب ابو الهيل حسين فالح حسين حمزة بكر سلمان

الملخص

درست استجابة الامتصاص الضوئي للأطوال الموجية (315–900) نانومتر لحامض السيلنك للجرع العالية لأشعة كاما . وجد ان الامتصاصية تزداد بزيادة الجرعة لأشعة كاما .وكذلك درست معدل الجرعة واستقراريها لطيف الامتصاص .اشيرت النتائج الى امكانية استخدام النموذج ككاشف للجرع العالية من اشعة كاما ضمن المدى (5–28)كيلو كري.

1-Introduction

The use of the change of optical absorption, of some plastics and glass materials with the given radiation dose is considered one of the methods that has greatly interested many researchers in the field of radiation dose measurement. This method has been known for hundred of years .they noticed that the colors of some materials were changed when its exposure to radiation dose, which attributed to the radiation damage. Radiation-induced changes in the optical density of glasses and plastics have been used occasionally to measure radiation quantity. Changes in the optical density are determined by measuring the transmission of visible or ultraviolet light through the materials before and after exposure to radiation. In fact , there are many materials that show changes in optical absorption when exposed to high absorption doses. Since gamma-rays penetrating power and ability to travel great distances is much higher, it finds wide range of applications including industrial process monitoring, medical imaging, environmental safety, remediation, national security, treaty verification and basic science [1–3]. Therefore it necessitated the people engaged in radiation dosimetry to wear the dosimeter device to ensure that they do not receive more than recommended dose level. The requirement of radiation dosimeter or sensor includes high sensitivity and linear performance over the intended energy range; real-time response, low noise, and acceptable reliability under the exposure conditions[4] In this work thin films of Silences acid were investigated to be applied as dosimeteric material evaluating the radiation dose response to Cs-137 gamma radiation.