شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومـــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـسـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

A STUDY OF ALPHA PARTICLE SPECTROSCOPY USING SOLID STATE DETECTORS

THESIS
SUBMITTED TO FACULTY OF SCIENCE MENOUFIA UNIVERSITY
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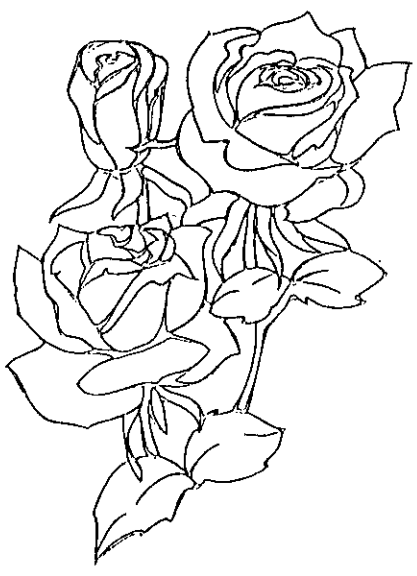
TO MY FAMILY



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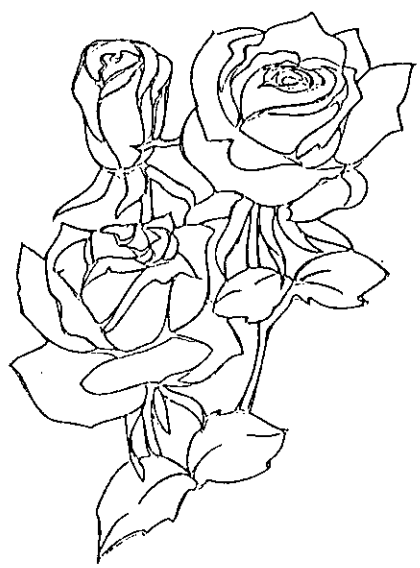
SUMMARY



SUMMARY

The application of the solid state nuclear track detectors (SSNTDs) has been widely increased in fields of radiation dosimetry and particle identification because they possess many advantages over the others. The study of a detector response requires the knowledge of the exact values of energy and incident angles of radiation. Such requirements is very important in designing and constructing an irradiation chamber which is the main task of this work.

The constructed irradiation chamber consists of (a) a rotating table carrying six plastic holders. The rotation of this table is controlled electronically via a stepper motor with a precision of 1.8 degree. The beam-to-detector direction could be adjusted with accuracy less than 5.0 degrees. (b) An alpha source which is moved vertically using another stepper motor. The source-to-detector distance is determined with an accuracy better than 1.0 mm. (c) An energy monitoring system, composed of a silicon surface barrier detector and signal electronic system attached to PC computer, is used for energy calibration.

The resolution of the solid state detectors as a function of energy in the range 2.0 - 5.0 MeV was determined by the mean of track diameter measurements in case of normal

incident radiation and etching duration varies from 4.0 to 10.0 hrs. It is deduced that the resolution depends on both energy and etching duration and can be improved by either increasing the energy from 2.0 to 5.0 MeV or etching time from 4.0 to 10.0 hrs. The critical angle of etching and the etching efficiency are also found to be energy and etching time dependent.

The thesis contains five chapters, conclusion and references. Chapter one is an introduction which contains a survey for the solid state nuclear track detectors and a review about earlier studies.

Chapter two includes the interaction of charged particle with the stopping materials specially with the solid state nuclear track detectors (inorganic, glasses and polymers). It also contains a survey about the track formation models which are total energy loss, primary ionization, secondary ionization, restricted energy Loss [REL], and radius-restricted energy loss [RREL].

Chapter three represents in detail, the track etching methodology and the etched track parameters in two cases i.e. constant and varying track etching rate, V_T. It also discuss the critical angle of etching and the etching

efficiency in case of thin and thick internal and external sources.

Chapter four contains the construction of the irradiation facilities and its characteristics. It also includes a study on the energy calibration and its dependence on the pressure inside the chamber and the source-to-detector distance, irradiation procedures, spectra of the alpha source at different values of pressures, the resolution of the surface barrier detector at different values of energies and the rate of alpha energy loss in air at different pressures.

In chapter five both of the detector energy resolution and efficiency were determined. The variation of track diameter with energy at normal incident is performed at different etching durations and the spread of track diameter, ΔD, is converted into a spread of energy, ΔE, using the track diameter-energy relationship and then the resolution was determined. The critical angle of etching is also determined, in this chapter, at different values of alpha energies and etching durations using two different methods, by direct observation of tracks and by the mean of both V_B and V_T. The etching efficiency is calculated from the critical angle. Also in this chapter, the etching parameters in case of inclined incident radiation with an angle 60^{o} were determined at different etching time.