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Comparative study of the effects of X-ray and electron irradiations on the optical properties of the Solid State Nuclear Track Detector (CR-39)

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Abstract

Recently, Solid State Nuclear Track Detector (CR-39) has a very important place at the top of the radiation detector for passive measurement, For this reason many investigation were done to improve the properties of this detector. In this investigation the energy gap of the SSNTD were calculated by measuring transmission at different wave length for ten samples, five of them were irradiated by electron at different energies while the other five samples were irradiated using X-ray at radiation part of the university hospital of Zagzig university, Zagzig, Egypt. Another one sample was used as standard sample. The transmission for all samples was measured at the National Research Center Al-Doqe, Cairo Egypt

Keywords: CR-39, energy gap

INTRODUCTION

In last Decades solid state nuclear track detector has the first priority of nuclear detectors in many fields; many types of detectors (organic and inorganic materials) were prepared to cover a wide range of nuclear measurements according to its properties It is well-known that Poly-allele-diglycol-carbonate (C-39) related to the chemical formula of $C_{12}H_{18}O_7$(its molecular structure is shown in Scheme 1) is one of the solid-state nuclear track detectors (SSNTD) that often uses in detecting charging nuclear particles.

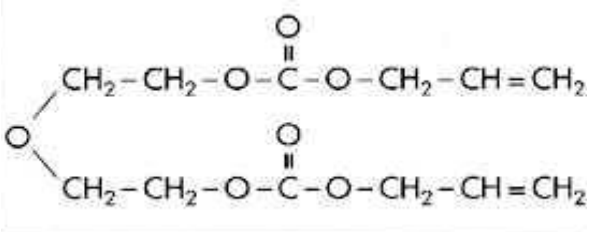

Fig.1 shows the basic chemical structure of CR-39 monomer.

The characteristic of CR-39 is visually transparent in the visible spectrum while most of it is completely opaque in the infrared and ultraviolet spectral regions (G. Marletta, 1990). It has been reported to the possibility of improving the properties of the polymeric materials through several treatments such as doping, irradiation, annealing *etc*., which make it a promising candidate for commercial applications (R.C. Ramola et al, 2009). Much of these effects, leads to modifying the materials polymeric structure *via* destroys the initial structure by way of the cross-linking which reflects an increase in the materials molecular weight and formation of a macroscopic network (H.S. Virk et al, 2001) *via* also a free-radical process of being formed, not able to be undone bond sharp divisions, etc. that outcome in the being broken into small of molecules and consistency of saturated and unsaturated groups (A.F. Saad et al, 2005). All these processes which lead to introduce the so-called defects inside