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ELECTROCHEMICAL ETCHING PROPERTIES OF CR-39 DETECTOR ----OPTIMIZATION OF PARAMETERS

Matiullah and N. Ahmad

(1) Centre for Nuclear Studies, P.O Nilore, Islamabad, Pakistan
(2) Department of Physics, University of Birmingham, Birmingham B15 2 TT, England

ABSTRACT

The revelation of neutron induced charge particle tracks in CR-39, employing chemical etching alone, suffers from poor etched track visibility which makes them difficult to distinguish from surface pitting, artifact, etc.. This problem of poor track visibility can be overcome by a technique called electrochemical etching (ECE). ECE enlarges the neutron induced tracks sufficiently enabling them to be counted under an optical microscope at low magnifications. However, ECE depends upon a number of parameters such as the electric field, frequency, etchant type and temperature, etc.. All these parameters have to be optimized. This paper outlines the effect of frequency, electric field and etchant temperature on the production and size of the ECE spots in CR-39 detector. In this context, experiments have been conducted with α-particles from ^{241}Am source and neutrons of energies 3 MeV and 19 MeV obtained from 3 MV Dynamitron. Our studies indicate that in order to obtain consistent and reproducible results, it is essential to optimize the electric field whilst the combined effect of frequency and electric field strength decides the average size of the ECE spot. The sensitivity (i.e. ECE spots/n) of CR-39 detector is also dependent upon the the etchant temperature employed during the ECE process.

INTRODUCTION

Since its introduction [1] the method of electrochemical etching (ECE) has been greatly developed for