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COMPARISON OF ^{27}Al (n, p) ^{27}Mg EXCITATION FUNCTION BY DIFFERENT TECHNIQUES

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ABSTRACT

Excitation functioh of ^{27}Al (n, p)^{27}Mg has been studied by five different techniques. First two are Al/Cu foil methods, using theoretical and experimental anisotropy factor. Tnird, fourth and fifth are Al/Cu powder, Al disc with concentric Cu ring and Al/Cu sandwich methods, respectively. The angular range covered, for neutron cross-section, is 0°—160°.

INTRODUCTION

Some previous investigators[1,2] have reported the neutron cross-sections and their variation with neutron energy around 14 Mev over the last decade of so. Cross-section data are important for testing the relevant nuclear theories, for measuring neutron fluxes[3], differential cross-section[4] and polarization[5]. The data may be used in measurement of neutron energies in some special cases[6].

The work reported here describes the determination of ^{27}Al (n, p) ^{27}Mg excitation function by five different methods. Prior measurements made for determination of the excitation function for this reaction were not in agreement. In the present work, a new target assembly was employed[7] to reduce the attenuation of the fast neutron flux caused by interaction with the thick copper backing of the target assemblies used in the previous investigations. The neutron yield from the T (d, n) ^4He reaction was measured with a neutron track detection method, which gives the relative values of neutron flux at different angles. The variation in the neutron flux with angle, obtained by this method, was used to obtain the variation of the cross-section for the ^{27}Al (n, p)^{27}Mg reaction with neutron energy.

The T(d, n) ^4He reaction was used for the production of 14 Mev range fast neutrons because it is the most suitable method for this purpose because of its high yield for low energy deuterons.

Experimental Procedure :

The deuteron beam was accelerated at 300 kev with a Van-de Groaff accelerator and allowed to strike a tritiated titanium target. Neutrons with different energies could be produced by the (d, t) reaction by varying the angular position with respect

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