

A STUDY ON THERMAL NEUTRONS  
AND  
EPITHERMAL NEUTRONS IN THAI RESEARCH REACTOR



by  
Nitaya Sudhiravuthe  
B.Sc.(Hons.), Chulalongkorn University, 1962

006968

Thesis  
Submitted in partial fulfillment of the  
requirements for the Degree of Master of Science  
in

The Chulalongkorn University Graduate School  
Department of Physics  
March, 1966  
(B.E. 2509)

Accepted by the Graduate School, Chulalongkorn  
University in partial fulfillment of the requirements  
for the Degree of Master of Science.

.....

Dean of the Graduate School

Thesis Committee ..... *ศาสตราจารย์ ดร. ประจักษ์* ..... Chairman

..... *ศาสตราจารย์ ดร. ประจักษ์* .....

..... *ศาสตราจารย์ ดร. ประจักษ์* .....

.....

.....

Thesis Supervisor ..... *ศาสตราจารย์ ดร. ประจักษ์* .....

Date ..... *March 25, 1966* .....

## ABSTRACT

Epithermal index at a position in a reactor was determined by cadmium ratio method. Gold, indium, and manganese, were used in this experiment. In all cases, corrections for self-shielding effect were necessary. The results of different materials used were consistent. Epithermal index was found to be 0.00953.



## ACKNOWLEDGEMENT

The author wishes to express her sincere appreciation to Mr. Vichai Hayodom, Chief of Health Physics Division, Office of the Atomic Energy for Peace for his advice and guidance given throughout the course of experiment. Thanks are also due to staff of the Office of the Atomic Energy for Peace. It should be mentioned that the author is indebted to Dr. Svasti Srisukh, Secretary-General, Office of the Atomic Energy for Peace in making this research possible.

## TABLE OF CONTENTS

	Page
ABSTRACT .....	iii
ACKNOWLEDGEMENT .....	iv
LIST OF TABLES .....	vi
LIST OF ILLUSTRATIONS .....	vii
Chapter	
I INTRODUCTION .....	1
II THEORY .....	2
2.1 Neutron Spectra in Reactor .....	2
2.2 Variation of Cross Section with Neutron Energy .....	5
2.3 Flux Perturbation by Detecting Foil .....	7
2.4 Westcott's Effective Cross Section .....	9
2.5 The Cadmium Ratio .....	10
2.6 Westcott Epithermal Index .....	12
III DESCRIPTION OF EXPERIMENT .....	15
3.1 Irradiation .....	15
3.2 Foils .....	15
3.3 Counting Procedure .....	16
IV EXPERIMENTAL RESULT AND DISCUSSION .....	17
ANNEX I Some Selected Parameters .....	23
ANNEX II $G_{th}$ and $G_r$ of Gold .....	24
ANNEX III $G_r$ of Manganese .....	25
ANNEX IV Error Calculation .....	26
Bibliography .....	30

## LIST OF TABLES

TABLE	Page
1 Test for the Goodness of $C_{th}$ (gold).....	17
2 Test for the Goodness of $C_r$ (gold) .....	18
3 $r\sqrt{\frac{T}{T_0}}$ at the Pneumatic Position .....	19
4 Summarized Results of $r\sqrt{\frac{T}{T_0}}$ .....	20

## LIST OF ILLUSTRATIONS

Figure	Page
1 Fission Spectrum .....	2
2 Spectrum in $\frac{1}{E}$ Region .....	3
3 Maxwell Spectrum in Thermal Region .....	4
4 Variation of Neutron Cross Section with Energy for a Typical Nucleus .....	6
5 Self-Shielding Factor for Slabs .....	9
6 Total Cross Section of Cadmium as a Function of Neutron Energy .....	11