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شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

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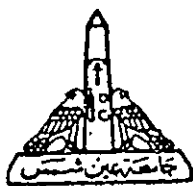
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Ain Shams University,
Faculty of girls, for Art,
Science and Education
Physics Department

**STUDY OF SLOW NEUTRON INTERACTION
WITH SOLIDS USING FIXED SCATTERING
ANGLE SPECTROMETER**

THESIS

Submitted for the Degree of Ph.D.in Physics

TO

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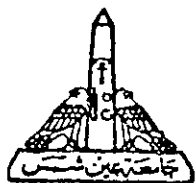
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• 2007



Ain Shams University,
Faculty of girls, for Art,
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Physics Department

A Thesis For Ph. D. in Physics
Fathy EL-Sayed Salama

TITLE OF THESIS
STUDY OF SLOW NEUTRON INTERACTION
WITH SOLIDS USING FIXED SCATTERING
ANGLE SPECTROMETER

THESIS SUPERVISORS

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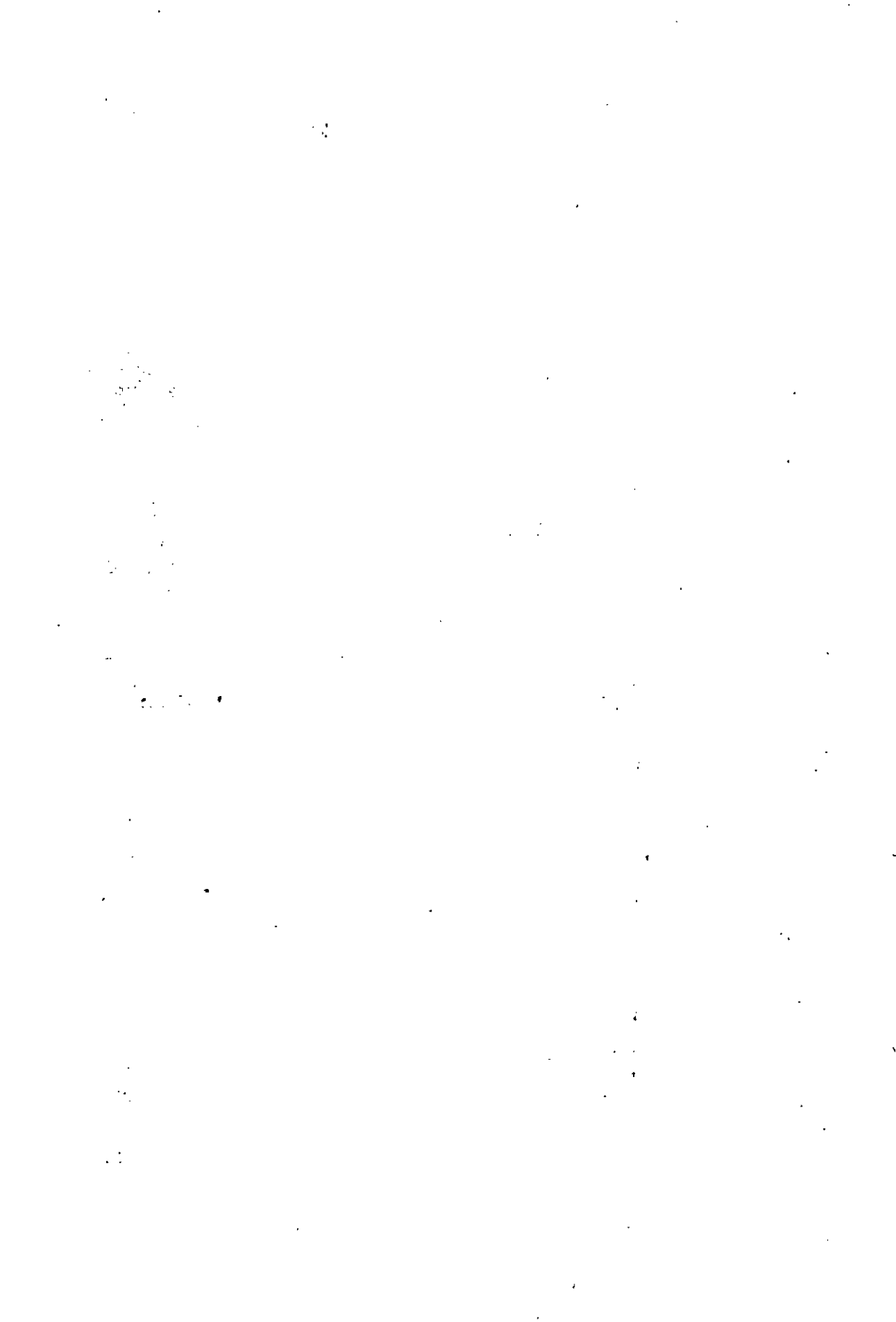
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Date of Research : / / 199 Date of Approval : / / 199

Approval Stamp :

Approval of Faculty Council : / / 199

Approval of University Council : / / 199



ACKNOWLEDGMENTS

I would like to express my appreciation, gratitude and sincere thanks to my supervisors .

- 1 - Professor Dr. Mansour Mohamed Hasab EL-Naby
Professor of Solid state physics, Ain Shams University, for his interest, helpful advises and his kind supervision during this work .
- 2 - Professor Dr. Mamdouh Adib.
Professor of Neutron physics, Deputy Chairman of Reactors Division, Atomic Energy Authority, For Suggesting the problem of this work, his Continuous guid, Fruitful discussions and supervision during this work .
- 3 - Professor Dr. Refaat Mahmoud Ali Maayouf,
Head of Reactor Physics department, Atomic Energy Authority . For his Keen interest during the course of this work and kind supervision .
- 4 - Professor Dr. Enayat Awad Saad
Professor of Theoretical Reactor Physics. Atomic Energy Authority for her continuous help and kind supervision .

Acknowledgments are also extended to

- 1 - Professor Dr. Hosnia Abo Zaid
Head of Physics Department, for her interest and kind encouragement .
- 2 - The scientific staff members of the Physics Dept., Faculty of Girls, for their valuable discussions raised during the scientific meetings .
- 3 - The Co-operation of Neutron Physics lab and Reactor operation Staff who provided the Smooth and long hours required for measurements .
- 4 - Dr. Kamelia Naguib Assistant Professor Theoretical Neutron Physics for her Valuable help in developing the computer codes required for calculations .

Abstract

Neutron transmission and reflection at a copper single crystal cut along the (200) plane were studied with the fixed-scattering angle spectrometer (FSAS) installed at the ET-RR-1 reactor. The FSAS used consists of a double synchronized rotor system whose physical parameters are given. The transmission was measured for neutron wavelengths between 0.21 and 0.47 nm at various orientations of the (200) plane with respect to the incident beam. The transmission data were analyzed using the general formula for the attenuation of thermal neutrons by an imperfect single crystal. An adapted computer program ISCANF-1 was developed in order to perform the required calculations. The calculated transmission data were found to be in good agreement with the measured ones within the statistical accuracy.

The study of the neutron filtering characteristics of Cu single crystal as a function of its physical parameters (mosaic spread, temperature, thickness) and cutting plane were given. It was found that the filtering characteristics of Cu cut along (200) plane, is preferable than that one cut along (111) plane having the same physical parameters.

The calculations using the ISCANF-1 program show that a 3cm thick crystal cut along (200) plane cooled at liquid nitrogen temperature is sufficient for removing fast neutrons of energies higher than 1eV, while providing reasonable intensity of the transmitted thermal neutrons. Moreover, the calculations show that the distortion of the transmitted thermal neutron flux caused by the strong parasitic Bragg scattering planes can be avoided when the direction of the [200] was inclined by 1° with respect to the incident neutron beam direction.

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