ELASTIC AND INELASTIC SCATTERING OF FAST NEUTRONS FROM HEAVY WEIGHT NUCLEI

by

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Physics in the Graduate School of Arts and Sciences of Duke University

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ABSTRACT

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ABSTRACT

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The energy spectra of neutrons scattered inelastically from Ta, W, Pt, Au, Hg, Tl, RPb, Bi, Th, and U have been measured using time-of-flight techniques. The measurements were made for incident neutron energies of 4.00, 5.00, 6.00, and 6.50 Mev. Nuclear temperatures and Fermi gas level density coefficients have been determined at each value of incident energy and compared with theoretical predictions. The results indicate that the Fermi gas model provides a good description of the variation of average nuclear level densities with excitation energy for all nuclei studied, except those near closed shells where the constant temperature approximation seems valid.

Angular distributions of 5.00 Mev neutrons elastically scattered from Ta, Au, Tl, RPb, Th, and U have been measured and compared with optical model predictions based on a local potential with variable parameters and the non-local potential of Perey and Buck. The results indicate that the data are described reasonably well by either potential.

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C. E. H.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ELASTIC AND INELASTIC SCATTERING OF FAST NEUTRONS FROM HEAVY WEIGHT NUCLEI