

NUCLEAR OPTICAL MODEL OF COMPOSITE PARTICLES AND DWBA IN STRIPPING REACTIONS

THESIS SUBMITTED FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY (SCIENCE)
OF THE
UNIVERSITY OF CALCUTTA

By

SANTOSH KUMAR SAMADDAR
SAHA INSTITUTE OF NUCLEAR PHYSICS

CALCUTTA

1972

T
137

CONTENTS

		<u>Page</u>
Preface and Acknowledgements	...	i
Conventions	...	iii
CHAPTER I : GENERAL INTRODUCTION	...	1
CHAPTER II : NUCLEON OPTICAL POTENTIAL		
1. Introduction	...	8
2. Generalised Optical Potential	...	9
3. On the Energy Averaged Cross Section	...	17
4. Phenomenological Optical Potential for Nucleons	...	20
5. The Equivalent Local Potential	...	31
CHAPTER III : OPTICAL POTENTIAL FOR COMPOSITE PARTICLES		
1. Introduction	...	39
2. Optical Potential for Deuteron	...	41
3. Optical Potential for a Three-Nucleon Projectile	...	55

CHAPTER IV : LINEAR ENERGY DEPENDENCE
OF THE NUCLEON OPTICAL
POTENTIAL AND THE OPCP

1. Introduction	...	63
2. The Choice of Nucleon Optical Potential Parameters	...	64
3. Evaluation of Functions $F(R)$, $G(R)$ etc.	71
4. Results and Discussions	...	77

CHAPTER V : THE ANALYTIC ENERGY DEPENDENCE
OF THE NUCLEON OPTICAL POTENTIAL
AND THE OPCP

1. Introduction	...	109
2. Evaluation of Cross-terms	...	112
3. Analytic Energy Dependence and the OPCP	132

CHAPTER VI : NON-LOCAL OPTICAL POTENTIAL
FOR COMPOSITE PARTICLES

1. Introduction	...	148
2. Expression for the Non-local OPCP	150
3. Equivalent Local Potential	...	158
4. Results and Discussions	...	159

CHAPTER VII	:	THE DISTORTED WAVE BORN APPROXIMATION AND THE (d,p) REACTION		
		1. Introduction	...	186
		2. The Transition Amplitude for the (d,p) Reaction	...	187
APPENDIX I	:	Evaluation of Certain Matrix Elements Occurring in the OPCP	...	206
APPENDIX II	:	Numerical Method for Solving the Integro-Differential Schrodinger Equation and Elastic Scattering Cross Section	...	211
APPENDIX III	:	A Few Operator Relations	...	217
APPENDIX IV	:	Reprints	...	220
REFERENCES			...	223