

**A STUDY ON IMPACT ENERGY REQUIRED IN  
MECHANICAL ALLOYING (MA)**

**DISEDIAKAN OLEH :**

**SALINA BUDIN  
AZNIFA MAHYAM ZAHARUDIN**

**AUGUST 2008**

Tarikh : 28 Ogos 2008  
No. Fail Projek : 600-IRDC/ST/FRGS 5/3/1187

Head of Research (Science & Technology)  
Research Management Institute (RMI)  
UiTM, 40450 Shah Alam,  
MALAYSIA

Prof./Prof. Madya/Tuan/Puan,

**LAPORAN AKHIR PENYELIDIKAN “A STUDY ON IMPACT ENERGY REQUIRED IN MECHANICAL ALLOYING (MA)”**

Merujuk kepada perkara di atas, bersama-sama ini disertakan 3 (tiga) naskah Laporan Akhir Penyelidikan tersebut untuk makluman pihak Prof./Prof. Madya/Tuan/Puan, .

Sekian, terima kasih.

Yang benar,



**SALINA BUDIN**  
Ketua Projek Penyelidikan

# CONTENT

Acknowledgement	i
Content	ii
APPENDICES	iv
List of Tables	v
List of Figures	vi
Abstract	vii
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Background	1
1.2 Significant of Project	2
1.3 Objectives	3
1.4 Scope of research	3
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.0 Introduction	4
2.1 History	4
2.2 Mechanism of MA	6
2.3 Collision event	8

## **CHAPTER 3 THEORETICAL MODELING**

3.0 Introduction	11
3.1 Theoretical Modeling of Impact Energy	11
3.1.1 Collision without the presence of work materials	13
3.1.2 Collision with the presence of work materials	14
3.2 Summary	18

## **CHAPTER 4 COMPUTER SIMULATIONS**

4.0 Introduction	19
4.1 Computer simulation procedure	19
4.2 Computer simulation result	23
4.2.1 Influence of ball mass	23
4.2.2 Influence of free falling height	26
4.3 Summary	32

## **CHAPTER 5: CONCLUSION AND RECOMMENDATION**

5.1 Conclusion	34
5.2 Recommendation	35

<b>REFERENCES</b>	<b>37</b>
-------------------	-----------

## **ABSTRACT**

In Mechanical Alloying (MA), the mixture of the work materials to be alloyed is placed in a container together with relevant milling medium. The vial and the charge materials are then moved in such a manner to create kinetic energy on the charge materials in the vial. Upon the collisions of the charge materials against each other as well as against the wall of the vial, kinetic energy is then converted into impact energy. This impact energy is then absorbed by the work materials for repeatedly flattened, cold welded, fractured and rewelded, which is an important mechanisms in MA. Since MA process utilizes energy generated by impact, it is important to understand the way on how kinetic energy of charge materials is transferred into impact energy. This report present a model of energy conversion and impact energy generation during the collision based on free falling experiment, which is a closest resemblance to the direct collision between ball and inner wall of the vial.