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صدق الله العظيم

DEDICATION

To my father

To my brothers and sisters and their family's

To the family of Juba University

To all those who respect me and I do respect them.

I would like to dedicate this work

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ABSTRACT

In this work, a simple gamma transmission-based non destructive system has been developed for scanning thickness defects in flat rolled products and discriminated samples with respect to their density. Based on radiation attenuation, the study involved the measurement of the thickness in centimeters scales for a flat sheets of Alumina ceramic, borated glass, aluminum and iron. The practicality of using the system to detect thickness flaws in millimeter range was calculated considering a scenario that a thickness change by 1mm is present along the sheet of each sample. This is done through the assessment of the degree of transmitted attenuation experienced by a beam of high energy ionizing radiation, such as ^{241}Am directed perpendicular to the planar surface of the material. The results confirmed the sensitivity of the system for detection of flaws in both thickness scales.

On the other hand, the performance of the proposed system in discriminating between the four samples was investigated. The results showed that, for Alumina ceramic, borated glass, aluminum and iron, the transmitted flux peaks at the energies, 13 KeV, 40 KeV, 20 KeV and 17 KeV, respectively. These results suggest the possibility of using such

energies to identify each of the four samples used.

مستخلص

في هذا البحث تم تطوير نظام فحص لا إتلافي بسيط وفعال يستند علي انتقال أشعة جاما لمصدر الأمريسيوم-²⁴¹ للاكتشاف عيوب السمك في عدد من الصفائح المسطحة لمواد معدنية وغير معدنية. كما تمت دراسة قدرة النظام علي تمييز المواد عن بعضها البعض إستنادا علي فيض الفوتونات النافذ عبر المادة عند طاقات محدد.

شملت الدراسة عينات من من السيراميك والزجاج والألمنيوم والحديد وتم تحليل النتائج بناء علي تقييم درجة توهين المادة في سمك معين لإشعاع المصدر. أثبتت النتائج أن النظام حساس للتغيرات التي تطرأ علي سمك الصفيحة المعنية تحت الاختبار في مدي الملليمترات والسنتيمترات. عند حدوث تغير في السمك يحدث تغير في الإشارة الناتجة في شكل فيض فوتونات و التي يمكن تحويلها الي إشارة مرئية او مسموعة.

من ناحية أخرى أكدت النتائج أن أعلى قيمة لفيض الفوتونات النافذة من السيراميك والزجاج والألمنيوم والحديد تحدث عند الطاقات 13 KeV، 40 KeV، 20 KeV ، 17KeV علي الترتيب. هذه النتائج تؤكد إمكانية استخدام هذه الطاقات في التمييز بين المواد موضوع البحث.

Contents

No	Descriptions	P.No.
1.	Aya	i
2.	Dedication	
3.	Acknowledgement	ii
4.	Abstract in English	iii
5.	Abstract in Arabic	iv
6.	Contents	v
7.	List of figs	vi
8.	List of tables	vii
Chapter One		
9.	1. Introduction	1
10.	1.1. Overview	1
11.	1.2. Surface condition	1
12.	1.3. Gamma transmission	2
13.	1.4. Previous studies	2
14.	1.5. Objective of the research	4
15.	1.6. Problem of the research	4
16.	1.7. Significance	5

17.	1.8. Limitation	6
18.	1.9. Organization of the research	6
Chapter Two (Radioactivity)		
19	2.1 Radioactivity	7
20	2.2 Radioactivity In Nature	7
21	2.3 Types of Radioactive Decay	8
22	2.3.1 Characteristics of alpha decay	8
23	2.3.2 Mechanism of alpha decay	9
24	2.3.3 Beta Decay	10
25	2.3.4 Electron capture	13
26	2.3.5 Gamma Emission and Internal Conversion	14
27	2.36. Spontaneous Fission and Neutron Emission	15
28	2.4 Natural Decay Series (Uranium, Radium, and Thorium)	16
29	2.5 Radioactive Decay	18
30	2.6 Radioactive Decay law	18
31	2.7 Activity and Half-Life	19
32	Half-life	20
Chapter Three (Gamma transmission- Based System for Thickness Measurement)		
33.	3.1. Introduction	
34	3.2 Nature of gamma rays	
35	3.3 Gamma Radiation Sources	

36.	3.4. Working principle	Chapter Four	
37.	3.5. Ions	(Materials and Experimental Measurements)	
38.	3.13. Introduction of Radiation		
39.	3.23. The Propriety Modality Gamma Rays		
40.	3.3. Description of gamma transmission technique		
45.	3.4. Types of Detectors		
56.	3.5. Experimental Arrangement		
47.	3.5.1. Gas Filled Detectors		
Chapter Five			
(Results and Discussions)			
48.	4.4. Introduction		
49.	4.5.2. Absorption Effects Based on Form of Radiation		
40.	4.2. Mass Attenuation Coefficient		
48.	3.7. Attenuation Characterization		
49.	2.7.1 Mass Attenuation		
50.	2.7.2. Absorber Mass Thickness		
51.	2.7.3. Half- Value Layer		

61	4.2.1. Alumina Ceramic	
62	4.2.2. Borosilicate Glass	
63	4.2.3. Aluminum	
64	4.2.4. Iron	
65	4.3.Sensitivity of the proposed system	
66	4.4.Material discrimination	
Chapter Six (Conclusion and Recommendations)		
67	Conclusion	
68	Recommendations	
69	References	

LIST OF FIGURS

Fig. 2.1	Emission of the alpha reduces the mass of the nucleus	8
Fig 2.2	B ⁻ Emission	10
Fig 2.3	B ⁺ Emission	12
Fig 2.4	Electron capture	13
Fig 2.5	gamma emission	14

Fig 2.6	Spontaneous fission	15
Fig 2.7	Activity and time is the exponential function	19
Fig 3.1	Sketch diagram for the general principles of gamma ray transmission systems for thickness measurements	
Fig 3.2	Spectral characteristics of photonic radiation released by the radioactive isotope Americium 241	
Fig 3.3	Gas filled detectors	
Fig 3.4	Components scintillation detector	
Fig 3.5	Illustration of various solid state detectors	
Fig 3.6	Typical arrangement components of solid state detectors	
Fig 3.7	Graphical representations of the Mass Attenuation Coefficient, (μ/ρ) , of the element Iron (Fe) as a function of the applied photonic energy	
Fig 3.9	photoelectric effect	
Fig3.10	Compton scattering	
Fig3.11	pair production	
Fig3.12	Illustration of attenuation of a photon beam in an absorber of thickness.	
Fig 4.1	Sketch diagram for the gamma ray transmission-based system	
Fig 4.2	Experimental Arrangement	
Fig 5.1	shows background flux of photons	
Fig 5.2(a)	Transmitted intensity as a function of thickness for alumina ceramic	
Fig 5.2(b)	Peaks of transmitted intensity as a function of thickness for alumina ceramic	

Fig 5.3(a)	Transmitted intensity as a function of thickness for Borosilicate glass	
Fig 5.3(b)	Peaks of transmitted intensity as a function of thickness for Borosilicate glass	
Fig 5.4(a)	Transmitted intensity as a function of thickness for Aluminum	
Fig 5.4 (b)	Peaks of transmitted intensity as a function of thickness for Aluminum	
Fig 5.5(a)	Transmitted intensity as a function of thickness for Iron	
Fig 5.5(b)	Peaks of transmitted intensity as a function of thickness for Iron	
Fig (5.6)	The sensitivity of the system in terms of transmitted flux with respect to thickness variations	
Fig.4.7	ig Peak Of transmitted intensity peaks for each sample were plotted against the corresponding energies	

LIST OF TABLES

Table 3.1	Radio- Isotope source used	
Table 3.2	Materials used	
Table 5.1	Results for Alumina Ceramic	
Table 5.2	Results for Borosilicate glass	
Table 5.3	Results for Aluminum	
Table 5.4	Results for Iron	
Table 5.5	Results for Alumina Ceramic	
Table 5.6	Results for Borosilicate glass	
Table 5.7	Results for Aluminum	
Table 5.8	Results for Iron	