PROCEEDING BOOK
THE 7TH INTERNATIONAL CONFERENCE ON BIOMEDICAL ENGINEERING AND MEDICAL APPLICATIONS (ICBEMA)
BME-DAYS 2012
SERPONG (BSD CITY), NOVEMBER 9TH-10TH, 2012
Theme: "Science and Technology for Health"

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FKG - UI
Proceedings
The 7\textsuperscript{th} International Conference on Biomedical Engineering and Medical Applications (ICBEMA) BME-Days 2012
Swiss German University
November 9-10, 2012
Tangerang, Indonesia

Organizers:
Preface

Welcome to Tangerang to the 7th International Conference on Biomedical Engineering and Medical Applications (ICBEMA) BME-Days 2012.

On behalf of the organizing committee, we are delighted to welcome all of the participants to the ICBEMA BME-Days 2012. This annual conference is organized under the auspices of the Swiss German University (SGU), University of Indonesia (UI), Indonesian Biomedical Engineering Society (IBES), Ikatan Dokter Indonesia (IDI), and Institute of Electrical and Electronics Engineer (IEEE).

ICBEMA BME-Days 2012 is an international conference on biomedical engineering that features scientific presentations, workshops, industrial and educational exhibitions, as well as panel discussions in biomedical engineering and alternative therapy in infectious diseases, cancer, and vascular diseases.

This conference also aims to strengthen the collaboration among international researchers, scientists, engineers and industrial players in the fields of science and engineering. It is designed to be a meeting point for those who are involved, to globally exchange and share their views, ideas and advances in science, technology, and industrial aspects.

Our gratitude to many people which helped making this conference a reality, to all of our invited speakers and guests, and for all of our committee members for their effort to ensure the success of this conference. Finally, we hope that all of participants will learn new things, make new contacts, get new ideas and have fruitful discussion while having a pleasant experience during our conference in Serpong.

Thank you.

Maruli Pandjaitan & Cholid Badri
Chairmen of ICBEMA BME-Days 2012
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Table of Contents

Keynote papers

Generating loko-regional heat impact: Available technologies and their specific efficacy and inherent restrictions
H. Sahinbas ................................................................. 1

Tele-Medicine: Technologies Enabling Medical Support for Patients in Their Usual Environment of Living
Matthias Görs, Markus Schäfer, Michael Albert, Kai Schwedhelm, Klaus Schilling .............. 2

Bioethical Aspect of Biomedical Engineering: the Stem Cell Case
Amin Soebandrio ........................................................... 6

Multi-scale Solutions for BioEngineering Applications
James Goh .................................................................... 7

The Healing Power of Enzyme Bromelain as Alternative Therapy for Several Diseases
Maruli Pandjaitan, Tutun Nugraha, Kezia H.Pamudja, Tiffani Wiriantono, Firman P. Idris,
Yosephina Jingga ............................................................ 8

Innovation circuits for medical applications

Designing Electrical Capacitance Tomography System for Early Breast Cancer Detection Based On FPGA.
Sastra Kusuma Wijaya, Nurhadi Ibrahim, Prasandhya Astagiri Yusuf, Asep Rahmat Hidayat and Donie Agus Ardianto ........................................... 15

FPGA As Main Controller For Pc-Based Medical Ultrasound
Juan Davin Partogi, Pratondo Busono and Aulia Arif Iskandar ........................................... 19

A Predictive Model for Diagnosis of Type-2 Diabetes Disease using Neural Network Approach
I Putu Dody Lesmana .......................................................... 24

The Effect of Immersion Time on Flexural Strength of E-Glass Fiber-Reinforced Composite
Siti Sunarintyas ................................................................. 31
Biomedical imaging technologies and image processing

Color Channel Allocation Scheme for Optimal Retinal Image Coding Based on Texture Analysis
Agung Wahyu Setiawan, Andriyan B. Suksmono, Tati Rajab Mengko and Oerip S. Santoso. 35

Lilik Anifah, I Ketut Eddy Purwana, Moch. Hariadi and Mauridhi Hery Purnomo. ............. 39

Statistical Texture Analysis in Dental Panoramic Images for Cyst and Tumor Classification Using Support Vector Machine.
Ingrid Nurtanio, I Ketut Eddy Purwana, Mochamad Hariadi and Mauridhi Hery Purnomo. . 44

Muhamad Hazwan Abdul Halim. ..................................................................................... 49

Study of Small Fields Using Multiple Detectors.
Bram Purwoko, Muhammad Fathony and Heru Prasetio. .................................................. 55

Evaluation of diagnostic Xray spectrum using Monte Carlo Simulation
Heru Prasetio, Andika Rachmat, Rahmi Ainur and Wijanarko Sasono. ............................. 59

Bioinformatics

Telehomecare: Patient's Data Gathering with LabVIEW in Jakarta.
Hana Auliana and Aulia Arif Iskandar. ............................................................................. 63

Surface and Subsurface Characteristics of AZ31B Magnesium Alloy Processed with High Energy Air Blast Shot Peening.
Budi Arifvianto, S. Suwigto, Imam Saputro and Muslim Mahardika. ................................. 69

Indoor Mobile Wireless Monitoring System for Medical Devices in Hospital.
Firdaus Firdaus, Afzalurahman Azhar and Hendra Setiawan. ............................................ 73

Development Of Application Software For Osteoporosis Level Detecting System On Proximal Femur.
Mera Kartika Delimayanti and Riantini. .......................................................... 77

Alvina Larisa ................................................................................................................... 81
Cell Engineering

Determination of ATPase in Human Blood as an Indicator in Overweight and Underweight People.
Hilda Vilisia Halomoan and Maruli Pandjaitan. .................................................. 87

Application of Butterfly Pea Root Extract in Increasing Learning and Memory.
Maruli Pandjaitan and Siska Rismayanti. .............................................................. 91

The Relationship Between Bone Mass Density and Radiomorphometric Index on Menopausal Women from Javanese Ethnic in Indonesia: A Pilot Study.
Rini Widyaningrum, Nyoman Kertia and Agus Harjoko ....................................... 96

Effect of fibrinogen/thrombin concentration on fibrin gel properties and angiogenesis development.
Gayathry N. Vadival Vadival, Mohammed R.A. Kadir Kadir and Irza Sukmana ............ 100

Extraction and Characterizations of alginites from Sargassum species.
Decky Indrani and Emil Budianto. ......................................................................... 104

Utilization of Centella asiatica and Acalypha indica to Improve Population of Peripheral Blood derived Mesenchymal stem cells.
Robi Irawan .............................................................................................................. 108

The Correlation between Texture Parameter of Mandible Trabecular Bone with The Bone Mass Density Value.
Sri Lestari, Gede Bayu Suparta and Nyoman Kertia .............................................. 112

The Effect of Clitoria ternatea L. Leaves Beverages in Blood Glucose Level in Mice.
Marisa Gabriela Tunggal, Abdullah Muzi Marpaung and Maruli Pandjaitan .............. 116

Wireless and energy harvesting/scavenging technology

Structural and Microwave Characteristics of Ba-La Hexaferrite/Fe2O3/LaFeO3 Composite for Cellular Phone Radiation Shielding.
Wisnu Ari Adi, Decky Indrani, Asep Hercuadi and Azwar Manaf ............................. 120

Development Progress of Android-based Personal ECG System.
Arga Aridarma, Tati L Mengko and Soegijardjo Soegijoko. ................................. 124
**Bioinstrumentation**

Effect of duration during Slag-ball blasting treatment on the microhardness in the Small Dynamics Compression Plate (SDCP).
Suyitno, Puntodewo, Urip Agus Salim and Novianto Rochman. .................................................. 127

Synthesis of Superparamagnetic Nanowire CaAl4Fe8O19 by Co-precipitation Method for Bone Cancer Therapy Application.
Susilawati, Suyatman and Bambang Sunendar. ................................................................. 131

Low Resonance Frequency Analyzer (LRFA ) As A Potential Tool For Evaluating Dental Implant Osseointegration.
Ratna Sari Dewi, Laura Susanti Himawan and Sri Angky Soekanto ........................................ 135

Preliminary Study of Hardware System from Digital Holographic Microscope Off-Axis Configuration with Interferometer Michelson.
Amy Hadiastuti, Andriyan Bayu Sukmono and Tati L Mengko. ........................................... 138

Design of Electrocardiograph 12 Lead and Blood Pressure Measurement using Computer.
Catherine Olivia, Linda Wijayanti and Harlianto Tanudjaja ................................................. 142
Structural and Microwave Characteristics of Ba-La Hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ Composite for Cellular Phone Radiation Shielding

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Abstract—Synthesis and characterization of Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite absorber was synthesized. Mixtures of BaCO$_3$, La$_2$O$_3$, and Fe$_2$O$_3$ were milled for 10 h by mechanical alloying process and then sintered at 1050 °C for 10 hours. Refinement results of the XRD pattern showed that the samples consisted of three phases, i.e. two hexagonal structures of Ba-La hexaferrite phase (P63/mmc) and Fe$_2$O$_3$ phase (R-3c) and also a cubic structure of LaFeO$_3$ phase (Pm3m). With the formation of the structure mentioned, the electromagnetic wave absorption curve which was obtained using a vector network analyzer showed that the samples have a very wide absorption bandwidth microwaves in the frequency range of 9-14 GHz. The maximum reflection loss of this band is -13.6 dB at a matching frequency of 11.46 GHz. We concluded that combining hexagonal ferrite and perovskite structures have produced Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite absorber with wide bandwidth microwaves absorption.

Index Terms — Microwave, absorption, composite, structure, and magnetic.

I. INTRODUCTION

Cellular phones, also known as mobile phones, have become a primary need in for communication. Cellular phones work using electromagnetic waves in the microwave range. However, the electromagnetic radiation from cellular phone may cause adverse effects to health problems in the end users [1-5]. To avoid the problems, a cellular phone requires a microwave-absorber material that can reduce or even eliminate the effect of microwave radiation.

Materials that have been used to reduce electromagnetic wave interference (EMI) are materials have high permeability and permittivity [6]. Several emerging materials are being developed. Previous research showed that electromagnetic wave absorption worked at X-band frequencies at 8-12 GHz for the hexagonal ferrite (Fe2O3) and Kυ-band frequencies at 12-18 GHz for perovskite (ABO3) [7]. To obtain a wider range of 8-18 GHz and to eliminate EMI [7-10], the combination of these two materials properties may be used.

Hexagonal ferrite (Ba$_2$Fe$_3$O$_9$) has a high permeability but a has low remanent. Therefore, Barium hexaferrite based (BaFe$_2$O$_9$) magnetic materials may be modified. The modification of the materials would substitute barium atoms with excess lanthanum atoms. It is expected that the presence of lanthanum can form a composite naturally between hexagonal structure of barium hexaferrite and perovskite structure. The aim of this research, therefore, was to analyze the effect of combining hexagonal ferrite and perovskite structures on the micro-wave absorption of the composite material.

II. MATERIALS AND METHOD

Raw materials were analytical grade, with purity of 99%, and were obtained from Merck. Samples of Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite were synthesized using the solid reaction method. Oxide materials, i.e. BaCO$_3$, Fe$_2$O$_3$, and La$_2$O$_3$, were mixed and were then milled using a high-energy
milling (HEM, Spex 8000, USA) for 10 hours at room temperature [11]. The finely mixed powder was compacted at 5000 psi into pellets and sintered in an electric chamber furnace (Thermolyne, USA) at 1050°C with atmospheric pressure for 10 hours and furnace cooled following the sintering.

The XRD analysis was conducted for phase identification. They were carried out using Phillips PW-1170 (Cu-Kα = 1.5404 Å), 40 kV. Sample were scanned between 20° and 80° with a stepwise of 0.02°/0.6 sec. The characteristic peaks were then compared with the ICDD no. 78-0131, 84-0306 and 75-0541. The Rietveld analysis was performed applying GSAS program. The pseudo-Voigt function was used in the describing of diffraction line profiles at Rietveld refinement [11].

The vector network analysis were conducted to analyze the effects of reflection and transmission of electromagnetic waves from signal source in a certain frequency. They were carried out using the vector network analyzer (VNA, Advantest R3770, USA) between 300 kHz - 20 GHz. Analysis of the reflection and transmission of the microwave result were performed at a frequency of 9 GHz to 15 GHz using a prototype form of bulk samples with a diameter of 25 mm and a thickness of 2 mm as shown.

III. RESULT AND DISCUSSIONS

Figure 1 showed the XRD patterns of the synthesized Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite samples. With respect to the position of diffraction lines (2θ) and their relative intensities (I), the XRD patterns were in agreement with ICDD no. 78-0131, 84-0306 and 75-0541. The XRD pattern showed in Fig 1 is as expected and in general similar with those published in several literature [12-14].

The phase identification was referred to the research results of some literatures [14,15] for the phases of BaFe$_2$O$_4$, Fe$_2$O$_3$, and LaFeO$_3$, respectively.

With respect to Fig.1, the addition of excess La$_2$O$_3$ has presented another phase eventually, namely Fe$_2$O$_3$, and LaFeO$_3$ phases. The mass fraction contained in the sample were shown as in Table 2. The highest content of th phase was Fe$_2$O$_3$ followed by Ba$_3$La$_{13}$Fe$_{13}$O$_{39}$.

<table>
<thead>
<tr>
<th>No.</th>
<th>Phase</th>
<th>Mass Fraction (% wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ba$<em>3$La$</em>{13}$Fe$<em>{13}$O$</em>{39}$</td>
<td>22.01</td>
</tr>
<tr>
<td>2</td>
<td>Fe$_2$O$_3$</td>
<td>62.48</td>
</tr>
<tr>
<td>3</td>
<td>LaFeO$_3$</td>
<td>15.51</td>
</tr>
</tbody>
</table>

Refinements of the XRD pattern from Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite were demonstrated in Fig. 2. The refinement result in good quality of fitting with very small R factor. Factor R, the criteria factor of fit, and the goodness of fit (S) were valued low as shown in Table 1; according to Izumi (1994), S values or χ² (chi-squared) was allowed a maximum number of 1.3 [11].

![Graph showing mass fraction of different phases](image)

**Figure 2.** The refinement of X-ray diffraction pattern of the Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite.

<table>
<thead>
<tr>
<th>Table 1. Structure Parameter and Goodness of Fit (S)</th>
</tr>
</thead>
</table>

| Ba$_3$Fe$_2$O$_4$ phase [12]                                                                 |
| Space group : P 63/m m c (194), Hexagonal                                                      |
| Lattice parameter :                                                                          |
| a = b = 5.886(7) Å and c = 23.168(8) Å,                                                       |
| α = β = 90° and γ = 120°                                                                     |
| V = 695.3(2) Å$^3$ dan ρ = 5.076 gr.cm$^{-3}$                                                |

| Fe$_2$O$_3$ phase [13]                                                                          |
| Space group : R -3 c (167), Hexagonal                                                            |
| Lattice parameter :                                                                             |
| a = b = 5.037(1) Å and c = 13.7455(5) Å,                                                        |
| α = β = γ = 120°                                                                                 |
| V = 302.0(2) Å$^3$ dan ρ = 5.274 gr.cm$^{-3}$                                                   |

| LaFeO$_3$ phase [14]                                                                            |
| Space group : F m -3 m (225), Cubic and Lattice parameter :                                     |
| a = b = c = 3.926(3) Å,                                                                        |
| α = β = γ = 90°                                                                                  |
| V = 60.6(1) Å$^3$ dan ρ = 6.619 gr.cm$^{-3}$                                                    |

Factor R $\chi^2$ (chi-squared) = 1.098
The calculation result of the total absorption of the Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite in the frequency range 9-14 GHz was shown in Figure 3. Figure 3 showed that the absorption of Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite was significant and it occurs in a wide range. The peaks resulted from the magnetic domain resonances. The ferromagnetic resonant frequency was derived from the magneto-crystalline anisotropy field.

The broadest range of the absorption frequency occurred around 9.0 -14.0 GHz, and the peak absorption occurred at a frequency of 11.46 GHz. It clearly appears that the bandwidth that can be covered by this ferrite is more than 9 GHz with reflection loss higher than -13.2 dB. This dispersion is due to the domain wall motion at lower frequency and spin resonance at higher frequency. This indicates that Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite has successfully presented potential absorbing property in X and Ku-band. The width of the absorption frequencies also known as broadband frequency. This shows a great opportunity that the composite can be applied as a candidate absorber material for microwaves radiation shielding on cellular phones.

IV. CONCLUSIONS

It is concluded that combining hexagonal ferrite and perovskite structures showed broader micro-wave absorption of the composite material with the absorption frequency between 9.0 - 14.0 GHz, and the point of the absorption peak occurred at a frequency of 11.46 GHz. This was due to the change in the structure of the hexagonal ferrite and perovskite to the structure of Ba-La hexaferrite/Fe$_2$O$_3$/LaFeO$_3$ composite.

ACKNOWLEDGMENT

The financial support rendered by the Riset Insentif Sinas Dr. Nurul Taufiqu Rochman, M.Eng, PhD. - Kementerian Riset dan Teknologi is greatly acknowledged.

REFERENCES


