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Padjadjaran International Physics Symposium 2013 (PIPS-2013)

Contribution of Physics on Environmental and Energy Conservations

Universitas Padjadjaran, West Java, Indonesia
7-9 May 2013

Editors
I Made Joni and Camellia Panatarani

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ISBN 978-0-7354-1180-7
ISSN 0094-243X
Printed in the United States of America

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AIP Conference Proceedings, Volume 1554
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Contribution of Physics on Environmental and Energy Conservations

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Preface: Padjadjaran International Physics Symposium 2013 (PIPS 2013)

I. Made Joni and Camellia Panatarani

Citation: AIP Conf. Proc. **1554**, 1 (2013); doi: 10.1063/1.4820271
View online: http://dx.doi.org/10.1063/1.4820271
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Preface: Padjadjaran International Physics Symposium 2013 (PIPS 2013)

The Padjadjaran International Physics Symposium 2013 (PIPS-2013) was held on the campus of Universitas Padjadjaran, Jatinangor, Bandung, Indonesia during 7-9 May 2013. Jatinangor, the home of a several university amid pleasant surroundings, was a delightful place for the conference.

PIPS02013 is organized by Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran and supported by Indonesian Physical Society (HFI), Material Research Society Indonesia (MRS-Id), and Indonesian Optical Society (InOS).

This symposium is aimed at enhancing communications among the researchers in physics and related fields to their contribution on environmental and energy conservations. The symposium covers a wide range of physics and its application for environmental and energy conservations, including material sciences, instrumentations, theoretical physics and geophysics.

The 13 invited speakers, 100 abstract contributions, totally 250 scientific participants discussions and exchanges that contributed to the success of the conference. Participants from 10 countries made the conference truly international in scope, i.e. participants from Indonesia, Japan, Singapore, France, India, Denmark, Australia, Japan, Fance, USA and Malaysia.

The abstracts were split into three category, i.e. material sciences, instrumentations & theoretical modeling and geophysics and of the total number of presented abstracts, 73 of these are included in this proceedings volume have been published by AIP Conference Proceedings .

Generous support for the conference was provided by Rector, Dean of Faculty Mathematics and Natural Sciences, and Head of Physics Department, Universitas Padjadjaran.

On behalf of the organizing committee, we would like to thank the advisory commitee, participants and all who has supported the successful of this scientific meetings. We also thank to all members of the organizing committee, it is an honor for us to receive a task as a corresponding Editors.

Corresponding EDITORS

I Made Joni

Camellia Panatarani

Padjadjaran International Physics Symposium 2013 (PIPS-2013)
AIP Conf. Proc. 1554, 1-1 (2013); doi: 10.1063/1.4820271
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The effect of molar composition of Co2+ to structure and magnetic properties of CoFe2O4

T. Saragi, N. Syakir, T. H. Nainggolan, C. Alboin, and Risdiana

Citation: AIP Conf. Proc. **1554**, 123 (2013); doi: 10.1063/1.4820300
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The Effect of Molar Composition of Co^{2+} to Structure and Magnetic Properties of $CoFe_2O_4$

T. Saragi*, N. Syakir, T. H. Nainggolan, C. Alboin and Risdiana

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Abstract. The powder sample of $CoFe_2O_4$ have been successfully prepared by a sol gel method with different Co^{2+} contents to study the effect of addition of percentage molar composition of Co^{2+} to its crystal structure and magnetic characteristics of $CoFe_2O_4$. The crystal structure of $CoFe_2O_4$ was measured by X-ray diffraction. Magnetization and their hysteresis properties were measured by vibrating sample magnetometer to investigate remnant magnetization, coercive field and uniaxial anisotropy field. The quality of crystal and magnetic properties of $CoFe_2O_4$ samples decrease with increasing the percentage molar composition of Co^{2+}.

Keywords: $CoFe_2O_4$, sol gel, magnetic remnant, coercive field, uniaxial anisotropy field.
PACS: 82.33.Ln, 75.47.Lx, 75.30.Cr, 75.60.-d, 75.60.Ch, 75.60.Nt

INTRODUCTION

Cobalt ferrite oxide ($CoFe_2O_4$) has become attractive material for electronics application because of their moderate saturation magnetization, high coercivity, mechanical hardness and chemical stability [1]. $CoFe_2O_4$ is a cubic oxide which has large magneto-crystalline anisotropy (2×10^6 erg/cm^3) and also high saturation of magnetization (33.44 kWb/m^2) [2-3]. The optimal structure for enhanced magnetic properties of Co ferrite is the perfect inverse spinel [4], in which the octahedral B sites are occupied by 8 ions of Co^{2+} and 8 ions of Fe^{3+} cations, while the tetrahedral A sites are occupied by remaining 8 ions of Fe^{3+} cations. This materials become a good candidate for many application in development of disc magneto-optical (MO) [5], millimeter-wave filters, phase shifters dan non-reciprocal devices with frequency tuning provided by an external magnetic field [6], Coplanar Waveguides (CPWs) in microwave integrated circuits (MICs) and monolithic microwave integrated circuits (MMICs) [7-8]. High performance of $CoFe_2O_4$ can be achieved by high values of remnant magnetization (M_r) and high values of coersivity (H_c).

For preparing $CoFe_2O_4$, a sol-gel method is one of an attractive alternative methods. With this method, the polycrystalline samples with small grain size of ferrite can be done in low annealing temperature [1]. High quality of $CoFe_2O_4$ can be obtained with controlling some parameters such as pH of the solution, concentration of the metal ions, and preparation temperatures.

In the previous work, we have been prepared $CoFe_2O_4$ without pH control. It is found that some impurity peaks of Fe_2O_3 with low magnetization characteristics due to the low of reaction in solution are observed.

In this paper, we reported the effect of addition of percentage molar composition of Co^{2+} to its crystal structure and magnetic characteristics of $CoFe_2O_4$.

EXPERIMENTAL

The starting materials for preparing $CoFe_2O_4$ are $Co(CH_3COO_2)_2.4H_2O$ as a precursor for Co^{2+}, and $Fe(CH_3COO_2)_2.9H_2O$ as a precursor for Fe^{3+}, methaoxyethanol as a solution, and diethanolamine as a catalis, respectively The persentage molar composition of Co^{2+}:Fe^{3+} are 33%:67%, 40%:60% dan 50%:50% respectively. The samples code for each composition are shown in Table 1. The raw materials was dissolved in 2-methaoxyethanol (100 cc) and diethanolamine. The solution (pH=9.5) was refluxed at 70 °C for 12 h and drying at 100° C by using hot plate. After drying process, all samples were prefiring for 500°C for 3 hours and following by sintering 900°C for 6 hours.

The crystal structures of all sintered samples were investigated by X-ray diffraction (XRD) measurements using CuKα wavelength.

Padjadjaran International Physics Symposium 2013 (PIPS-2013)
AIP Conf. Proc. 1554, 123-125 (2013); doi: 10.1063/1.4820300
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