

ISBN 978-602-72198-0-9

PROCEEDING ICOS 2014

The 1st International Conference On Science

III. A. 1. c.1. b. / 49

III. A. 1. c.1. b. / 50

"Science Enhancement For Developing Countries"

FACULTY OF MATHEMATICS AND NATURAL SCIENCES
HASANUDDIN UNIVERSITY

PROCEEDING
The 1st International Conference On Science 2014



Supported by





Proceeding

The First International Conference on Science (ICOS-1)

Editors

Chief : Magdalena Litaay M.Mar.Sci, Ph.D
Member : Dr. Nurtiti Sunusi M.Si
Dr. Fachruddin M.Si

Reviewer

Prof. Dr Dahlang Tahir M.Si	(Physics, UNHAS)
Sri Astuti Thamrin M.Stat, Ph.D	(Mathematics & Statistics, UNHAS)
Paulina Taba M.Phil, Ph.D	(Chemistry, UNHAS)
Dr. Eddy Soekendarsi M.Mar.Sci	(Biology, UNHAS)

Publisher: Fakultas Matematika dan Ilmu Pengetahuan Alam UNHAS
Address: Jl. Perintis Kemerdekaan KM 10 Tamalanrea 90245 Makassar
Tlp (0411) 586016, Fax (0411) 588551
Email: ahaddade@fmipa.unhas.ac.id



PREFACE

Makassar city, the capital of South Sulawesi province known as one of the biggest cities in Indonesia and also having Hasanuddin University, the biggest university in eastern part of Indonesia, has plenty of natural resources and human resources. Having a strategic position at the center point of Indonesia, Makassar has been developing very rapidly, and has been contributing to the regional, national and even international economic development. Given this, science can play important roles and therefore is needed to support rapid development in various sectors.

With regard to this, cooperates with Ministry of Environment Indonesia, Atmospheric and Ocean Research Institute (AORI) Japan, University of Kebangsaan Malaysia (UKM), Alfred Wagener Institute (AWI) Germany, Queensland University of Technology (QUT) and Flinders University Australia, Faculty of Mathematics and Natural Sciences Hasanuddin University carried out "The First International Conference on Science (ICOS-1)" on November 19-20, 2014, in Hotel Clarion Makassar. The theme of ICOS-1 is "Science Enhancement for Developing Countries". The conference attended by two hundred participants and came from Asia (Japan, Malaysia, Indonesia), Australia, and Europe.

There are approximately 97 research articles for oral presentations and 16 poster presentations, ranging from Biology, Statistics, Mathematics, Chemistry, Physics, Geophysics, Computer Science and Environmental Science. Of the 113 papers, there are approximately 79 papers were selected to be published in the proceedings of the ICOS-1 through the peer review process.

With regard to the delivery of the ICOS-1 in 2014 and the completion of the proceedings ICOS-1, 2014, allow us to thanks to: the authors for providing the content of the program, the conference participants who came from several public and private universities, the program committee and the senior program committee, who worked very hard in reviewing papers and providing feedback for authors to be included in the Proceedings of ICOS-1, 2014, the hosting organisation Hasanuddin University, our keynote and invited talk presentations including Ir. Muh Ilham Malik M.Sc, from Ministry of Environment Indonesia, Prof Koji Inoue from AORI Japan, Prof Mohammad B Kassim from UKM Malaysia, Dr.rer.nat Dominik Kneer from AWI Germany, Prof Dadang A. Suriamihardja and Prof Alfian Noor from Hasanuddin University, Prof Kerrie Mengersen from QUT and Dr. Darfiana Nur from Flinders University, Australia.

Hopefully is of benefit to all readers.

Yours faithfully,
Prof Dr. Hanapi Usman M.S
Dean of Faculty Mathematics and Natural Sciences
Hasanuddin University



TABLE OF CONTENTS

COVER	i
PREFACE	iii
TABLE OF CONTENTS	iv

KEYNOTE SPEECH

Muh Ilham Malik and Gunawan. Indonesian Policy on Hazardous Substances, Hazardous Waste, Contaminated Site Remediation and Domestic Waste Management 1-9

Mohammad B Kassim. Extending the Photo Response of Titanium Dioxide Photo Electrode with Ruthenium-tungsten Dye-sensitiser 10

Dadang A. Suriamihardja. Understanding Economic Sustainability from Thermodynamic Viewpoint 11-20

Koji Inoue, Irma Andriani and Zainal Arifin. *Oryzias* Fishes: Important Scientific Resources in Sulawesi 21-27

Kerrie Mengersen. Bayesian Modelling and Analysis of Big Data 28

Alfian Noor. Exploring Sponge Role in Alleviating Metal Pollution of Coastal Marine Environment: Some Experimental Results in Eastern Indonesia 29-33

Dominik Kneer, Simona Laukaityte, Leonardo Calderon Obaldia and Ruth Lewo Mwarabu. The Impact of Climate Change on Coral Reefs, and the Mitigation Potential of Sea Grasses 34

Darfiana Nur and James Totterdell. Bayesian Hidden Markov Model for Homogeneous Segmentation of Simian Vacuolating Virus (sv40) 35



ORAL PRESENTATION

I. BIOLOGY

- B.1. Asriyanti, Magdalena Litaay, Eva Johannes, Indah Raya.** The Effect of Fe³⁺ Ion Addition towards The Omega-3 (DHA) Production on Phytoplankton *Chlorella vulgaris*
..... 36-42
- B.2. Rahmi Rozali.** Selection of Isolates of Azotobacter Sp. Rhizosphere of Plants Cocoa and Ability in Dissolving Phosphate
..... 43-48
- B.3. Eka Sukmawaty.** Testing of *Bacillus Thuringiensis* Subsp. *Aizawai* Toxin, *Beauveria bassiana* Conidia and Mix Cultured to Armyworm (*Spodoptera Litura*)
..... 49-55
- B.4. Mu'minah, Baharuddin, Hazarin Subair, Fahrudin.** Production of Exopolysaccharide (Eps) Isolated From Bacterial Potato Rhizosfer on Several Sources of Carbon
..... 56-63
- B.5. Haerunnisa, Ahmad Yani, Lismawati.** Study of Relationship and Similarities Test Tawes Fish *Barbonymus gonionotus* and Nilem Fish *Osteochilus hasselti* in Tempe Lake through and Methods Morphometric Meristic.
..... 64-73
- B.6. Kafrawi, Baharuddin, Enny L. Sengin, Ade Rosmana.** Exploration of Free-living Rhyzobacteria from Shallot in Sulawesi Island and their Phosphate Solubilizing Activity
..... 74-82
- B.7. Zulkifli Razak, Muhammad Arif Nasution, Suryawati Salam.** Seed Technology Adoption Grafting Seed of Passion Fruit (*Passiflora Edulis*)
..... 83-87



M. 3. Chairul Imron, Sentot Didik S. The influence of Reynolds Number on the Drag Coefficient of a Circular Cylinder	258-262
M.4. Dwi Ratna Sulistyaningrum, Budi Setiyono. The Defect Detection on Bullet P production using Edge Detection and Euclidian Distance.	263-267
M.5. Marjono, C.A. Ferima. Estimation of Least Upper Bound on the Modulus of Starlike Function Coefficients.	268-271
M.6. Sabri, Ilham Minggu. Students' Difficulties in Mathematics Proofs	272-280
M.7. Naimah Aris. Regularity of Global Attractor for a Quasilinear Parabolic Equations with <i>M</i> -Laplacian Type	281-289
M.8. Nur Erawaty. Equivalence Rational Matrices at Infinity	290-298
M.9. Selvi Rajuati Tandiseru. Development of Teaching Materials Based Local Culture in Improving the problem Solving Ability of Students' mathematical	299-305
M.10. Syafruddin Side. Solution of Poisson Equation with Boundary Element Method	306-314

IV. CHEMISTRY

C.1. Fathur Rahman Ma'rifatullah, Indah Raya, Hasnah Natsir. The Temperature Effect on Synthesis of <i>Hydroxyapatite Nanocrystal Through Precipitation Methode</i>	315-320
C.2. Indra Permata A.S., Indah Raya, Ahyar Ahmad. Synthesis and Characterization of Cu(II) and Zn(II) Complex and their Potency as Anti Tuberculosis	321-326
C.3. Kasmawaty Iswar, Indah Raya, Maming. Effect Stirring Time Variations of Synthesis Hydroxyapatite of Blood Shells (<i>Anadara Granosa</i>)	327-332
C.4. Lydia Melawaty, Alfian Noor, Tjodi Harlim, Nicole de Voogd. <i>Clathria reinwardtii</i> As a Zooremediator of Heavy Metal Manganese (Mn)	333-338
C.5. Firdaus, Dirayah Husain, HerlinaRasyid, Sukarti. Methylation of <i>p</i> -Coumaric Acid with Dimethyl Sulfate and Sodium Hydroxide as Catalyst	



.....	339-344
C.6. Diana Eka Pratiwi, Suriati Eka Putri. Characterization of Banana Peel Briquettes with the Variation of Binder Concentration	
.....	345-351
C.7. Isran Asnawi, Hasnah Natsir, Nunuk Hariani. Exploration of Lipolytic Enzymes Microbes from Lemo Susu Hot Spring, Pinrang, South Sulawesi, Indonesia	
.....	352-361
C.8. Syamsidar HS, Nurfaidhah Natsir. Bioremediation and Phytoremediation of Waste Oil Contaminated Soil using Biokompos with Sengon Plants	
.....	362-367
C.9. Sitti Chadijah, Andi Wahyu Trifany. Kinetics Delignification of Bagasse with Alkaline Peroxide Process.	
.....	368-375
C.10. Nunuk Hariani, Firdaus, Nursiah La Nafie, Nur Umriani Permatasari, Ajuk Sapar. A preliminary Study of Spons Species from Kapoposang Island, Spermonde Archipelago and Bioactivity Test of their Methanol Extracts	
.....	376-381
C.11. Aisyah, Rahmawati Azis, Yunizar. Synthesis of Fatty Acid Ethyl/ Methyl Ester from Candlenut Oil Utilizing Ultrasonic Device	
.....	382-387
C.12. Maming, Erny Rosmawati, Paulina Taba, Jabal Nur Basir, Indah Raya. Synthesis of Biomaterial Hydroxyapatite from Egg Shells and Its Potency as Material for Remineralization of Teeth	
.....	388-393
C.13. Muliadi, Deasy Liestianty, Zulkifli Tuara. Study on Toxicity of Ni ²⁺ ion to the Growth of Marine Phytoplankton <i>Dunaliella Salina</i> in Conwy Medium	
.....	394-399

V. ENVIRONMENTAL SCIENCE

ES.1. Dewi Yanuarita, M. Rijal Idrus, Irwanto. Communities Vulnerability of Spermonde Coral Islands	
.....	400-408
ES.2. Akbar Tahir, Farid Samawi, Yeis Pairunan, Masrul Jaya. Assessment of Pb Metal Concentrations on Water Column, Sediment and Organisms at Kayangan Island Waters of Makassar City	
.....	409-418



ES.3. Iradhatullah Rahim, Halima Tusadiyah, Muh. Iqbal Putera, Suherman, Asmaul Husna. The Utilization of An Agricultural Waste As A Source of Organic Matter of Nutrients in Maize
.....419-424

VI. COMPUTER SCIENCE

CS.1 Mohammad Isa Irawan, Daryono Budi Utomo. Optimization model of Planting Pattern Management Based on prediction of artificial Neural Network
.....425-446

CS.2. Marji, Dian Eka Ratnawati, Achmad Basuki. Random Search Method to Build the Software Special Diet Nutrition Patients (Running on Android)
..... 447-453

VII. PHYSIC

P.1. Syamsir Dewang, Bannu, Nurhasanah. Measurement of Radiation Dose on Radiodiagnostic X-ray machine with a Tube Voltage and Current Variations
.....454-461

P.2. Wira Bahari, Hariati, Sri Suryani. Characters of Temporal and Electric Potential Function from ECG for Patients with LVH Cardiac Abnormalities
..... 462-469

P. 3. Andi Nurul Aeni Daud, Aswar Syafnur, Harjumi, Indah Nurul Mutiah. Soil Density and Moisture Measurement Using Electrical Density Gauge (EDG) In 'S' Area
..... 470-474

P.4. Nurul Muhlisah, Sernita Domapa, Muhammad Taufiq Rafie, Andi Tenri Awali Wildana. Determination of Lithology and RQD (Rock Quality Designation) Value Using Well Logging and Full Coring In 'T' Area
..... 475-481

B. POSTER PRESENTATION

Po.1. Nur Haedar, Asadi Abdullah, Ruslan Umar, Ambeng. Production of Poly-B-HydroxyButyrate (PHB) by Isolates Bacteria from Sugar Factory Waste on Some Substrate Molasses Concentrations
..... 482-487

Po.2. Elis Tambaru. The Comparative Characteristics Cell of Leaves Anatomy of Motor Vehicles Location and Less Polluted in Makassar City Indonesia



.....	488-492
Po.3. Ismail Marzuki. Isolation and Identification on Degradator Bacterium of Petroleum waste which Symbions with Sponge from Melawai Beach	
.....	493-503
Po.4. Nirmalasari Idha Wijaya, Triyanto. The Influence of Eye Stalk Ablation to Gonadal Maturity of Mud Crab <i>Scylla Serrata</i> That Cultivated on Battery Cell Cage	
.....	504-509
Po.5. Juhriah, A. Masniawati, Mir Alam . Genetic Diversity of 1 st Generation Selfing Local Corn of Selayar Regency South Sulawesi And Corn From Cimmyt Based on Simple Sequence Repeat (Ssr) Molecular Marker	
.....	510-517
Po.6. Zaraswati Dwyana, Nurul Muthmainnah. Production and Optimization Anti diarrheal Agent from Potency of <i>Lactobacillus acidophilus</i> at the Variation pH and Temperature	
.....	518-523
Po.7. Rosana Agus. Characterization Of Recombinant Protein Esat-6 Mycobacterium Tuberculosis As Immunodiagnostic Latent Tuberculosis	
.....	524-529
Po.8. Nur Aliah Rusman, Magdalena Litaay, Zaraswati Dwyana, Nur Haedar, Elmi Zainuddin, Kurniati Umrah Nur. Bioactivity of Sponge <i>Clatria sp</i> Symbiotic Bacteria against <i>Staphylococcus aureus</i> and <i>Salmonella typhi</i> .	
.....	530-536
Po.9. Waode Nur Rahmaniah, Alfian Noor, Muhammad Zakir, Maming. Utilization of diethanolamin as CO ₂ absorbent for measurement of Carbon-14 in Coral Sample from Langkai Island	
.....	537-543
Po.10. Andi Asdiana Irma Sari Yusuf, Maming, Muhammad Zakir, Alfian Noor. Utilization of Ethanalamine as Carbon Dioxide Absorber for Estimating of Coral Age from Langkai Island via LSC (Liquid Scintillation Counting) Method	
.....	544-551
Po.11. Febby Kurniaty, Maming, Muhammad Zakir, Alfian Noor. Utilization of Sodium Hydroxide as Absorber for ¹⁴ C Analysis of Coral Ages Estimation in Langkai Island Using LSC (Liquid Scintillation Counting) Method	
.....	552-559
Po.12. Agnes Rantesalu, Nursiah La Nafie, Syarifuddin Liong. Synthesis of Silver Nanoparticles using <i>langsat peel</i> Extract <i>Lansium domesticum</i>	
.....	560-567



Po.13. Tuti Suprianti, Indah Raya, Hasnah Natsir. Effectiveness Extract of Fatty Acids of Microalga *Chlorella Vulgaris* as a Cream to Repair The Face Skin Texture

..... 568-572



THE TEMPERATURE EFFECT ON SYNTHESIS OF HYDROXYAPATITE NANOCRYSTAL THROUGH PRECIPITATION METHODE

Fathur Rahman M, Indah Raya^{1*}, Hasnah², Maming³, Kasmawaty Iswar⁴

^{1,2,3,4}Chemistry Department, Faculty of Mathematics and Natural Sciences, Hasanuddin
University, Makassar 90245, Indonesia

*Email: indahraya05@gmail.com

Abstract

Hydroxyapatite (HAp) is a material that similar to the structure of human hard tissue (bone and teeth). Nano-hydroxyapatite has increase cell proliferation and cellular activity associated with bone growth. This study purpose at synthesizing HAp that use egg shells compost as a source of calcium which was reacted with $(\text{NH}_4)_2\text{HPO}_4$. HAp in this study were synthesized by precipitation method, in the first phase, carried out of calcination shell eggs, the second phase synthesized by precipitation method with temperature variations and the third stage to perform sintering with variations time. The results of the synthesis were characterized using XRD, FTIR, and SEM instruments. The results showed that over all diffractograms shows the phase of HAp, but there are other phases such as α -TCP, β -TCP, AKA, and AKB. The optimum temperature of synthesis is 40°C, while sintering optimum temperature is 800 °C for 1 hours. These conditions revealed a particle size of 62,31 nm. The higher temperature showed the greater size of particle.

Keywords: egg shells, calcinations, hydroxyapatite.

1. INTRODUCTION

Hydroxyapatite (HAp) is made by chemical synthesis called synthetic HAp. Synthetic HAp can be obtained not only by reacting synthetic compounds but also react with natural compounds that could be used as a substitute for human hard tissue^[1].

Nanostructured hydroxyapatite have better bioactivity than big structure crystals. Nano hydroxyapatite have a grain size < 100 nm, a high surface activity and structure similar to the mineral found in bones and teeth hard tissue^[2]. It is known that bioceramics similar mineral composition and structure of the bone could be easy to encourage the following formation of bone tissue^[3].

There are many methods that have been used to synthesize HAp, one of them used precipitation method, this method has the advantages of the process of synthesis meanly simple, low processing costs, low contamination during mixing, and can high level of HAp purity^[4].

The eggs produce waste in the form of egg shells is a source of calcium carbonate (CaCO_3) in the largest more than 95 %, based on data from Statistics and Animal Health^[5]. The chicken laying generate egg as much as 1.0278 million tons or 68.75 % of the total egg production and in 2011 of 1.4562 million tons.

The production of chicken egg shells will continued to abound along with its use as a raw material for food and to benefit other areas and it is one of very promising alternative processing into hydroxyapatite^[6]. Making calcium from eggshell then need to be changed first in a form that is easier to absorb the body.



Innovation on the synthesis of HAp nanoparticles with utilization of waste eggshell give high odds and very worth to be developed further.

Innovation in nanocrystal synthesis by utilization of waste eggshell give high odds and should be developed further. The researched aim to determine the effect of temperature on the synthesis of nano-crystalline HAp with calcium precipitation method in which the source is derived from the shells of chicken eggs

2. METHODOLOGY

2.1 Materials and Apparatus

Tools used are glass tools, burettes, funnels, furnace, analytical balance, magnetic stirrer, magnetic bar, Idcalife hotplate, 6000-Barnstead Thermolyse furnace, desiccator, thermometers, oven Spnissosfd, stopwatch, atomic absorption spectrophotometry (Perkin Elmer ® 900T) X-ray diffractometer Shimadzu 6000 model, and FTIR (Fourier Transform infra Red) Prestige-21 Shimadzu.

The materials have been used, among other waste egg shells, $(\text{NH}_4)_2\text{HPO}_4$, distilled water, aluminum foil, and Whatman filter paper number 42.

2.2 Scope of Research

Hydroxyapatite was synthesized by precipitation method. Shell eggs is used as sources of calcium, while the phosphorus comes from $(\text{NH}_4)_2\text{HPO}_4$. In the first phase, do calcining egg shells, the second phase of the synthesis is performed by precipitation method. The third phase is done by varied the sintering time. The results is identified by XRD, FTIR, and SEM.

2.3 Calcining egg shells.

Waste eggshell is cleaned by distilled water and dried at room temperature. Furthermore, the calcination is carried out at the samples on 1100°C temperature for 25 hours. After that, the calcium levels is tested using XRF.

2.4 Synthesis by precipitation method.

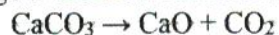
Calcium oxide (CaO) as calcination result then suspended in 100 mL of distilled water with 1 M of concentration of Ca. After that, 100 mL of 0.6 M solution $(\text{NH}_4)_2\text{HPO}_4$ dropwise added to CaO suspension at 20, 40, 60, 80, and 100°C temperatures while the solution is stirred with magnetic stirrer with a time of 5 hours and allowed to stand for 24 hours at room temperature. Afterwards, the precipitate formed is filtered with Whatman 42 filter paper and dried at 110°C for 5 hours.

2.5 Sintering.

Furthermore, sintering is performed to dried precipitate to obtain compound $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ at 800°C for 1 hour. After that, the characterization of the compounds $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ produced by using X-ray diffraction and FTIR.

3. RESULT AND DISCUSSION

Characterization results calcination phase shell eggs observed using X-ray diffraction and calcium levels is tested by XRF. Variation of time in the calcination process aim to examined optimum conditions the CO_2 ion release into the air. Calcining eggshell will undergo a chemical reaction as follows:



Calcination reaction can occur when the compound contain calcium is heated at a temperature above the melting point (melting point of Ca = 825°C). Eggshell is calcined at 1100°C caused calcium carbonate decomposes into calcium oxide and



carbon dioxide. Presence of carbonate may interfere process formation of crystalline HAp^[7].

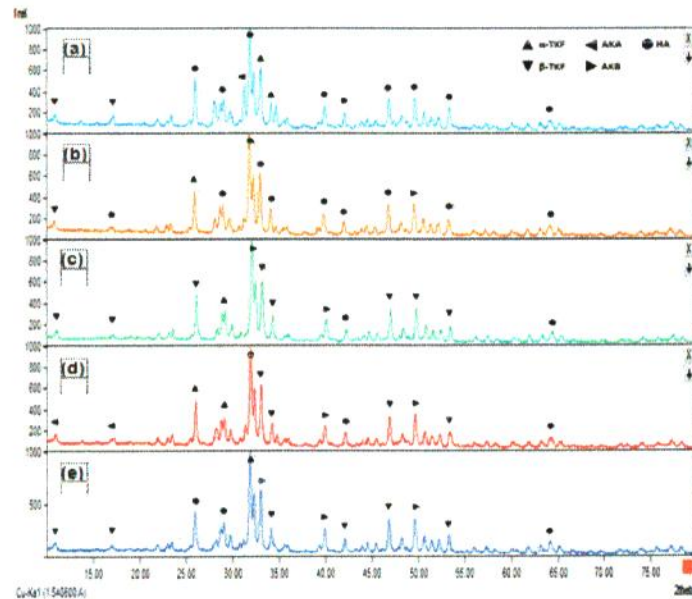


Figure 1. XRD pattern of temperature variation (a) 20, (b) 40, (c) 60, (d) 80, and (e) 100 °C

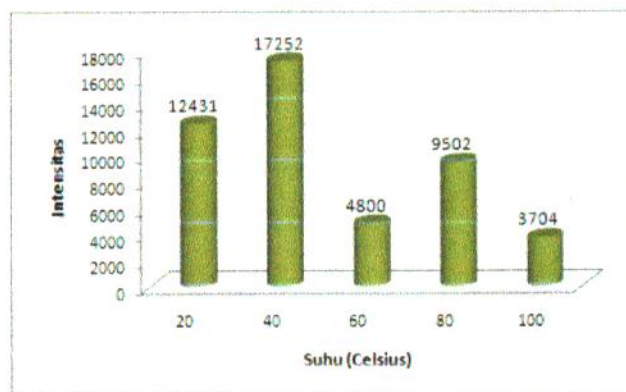


Figure 2. Effect of synthesis temperature on the formation of HAp

Analysis results in figure 1 shows that HAp compound begin detected at 20 °C. The intensity of HAp phase formation increases at temperatures of 40 °C and at 60 - 100 °C is decreased. significantly, HAp compound is formed calculation to phase probability sample XRD results via matching with JCPDS standard data and seen from the XRD pattern obtain optimum synthesis temperature is 40 °C with an intensity of 17252.

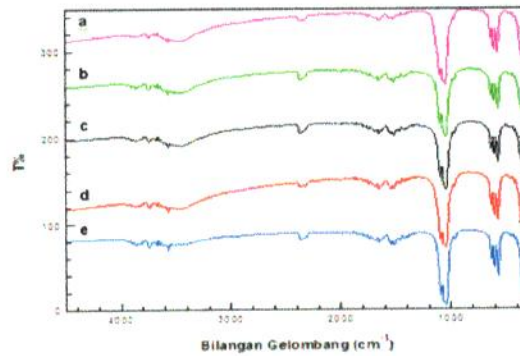


Figure 3. Spektroskopi FTIR spectrum at variation of temperature (a) 20, (b) 40,(c) 60, (d) 80 and (e) 100 °C

Hydroxyapatite (HAp) synthesis (figure 3) shows the overall phase has been formed HAp but formed the carbonate apatite phases, namely type A carbonate apatite (AKA) with molecular formula $\text{Ca}_{10}(\text{PO}_4)_6\text{CO}_3$ and type B carbonate apatite phase (AKB) with the molecular formula $\text{Ca}_{10}(\text{PO}_4)_3(\text{CO}_3)_3(\text{OH})_2$. AKA phase, the position of OH on HAp structure is replaced by carbonate ions, while at phase AKB the position of the PO_4^{3-} replaced by carbonate ions. It can be happened because in general as well as the results of biological apatite synthesis at low temperatures is carbonate apatite type B, whereas apatite produced from dense reactions and high-temperature are type A carbonate [8]. Samples at 40°C with 5 and 2 hours sintering time shows of HAp phase for the entire peak with high purity compared to other samples.

In addition to the AKA and AKB formed at HAp synthesized there β -TCP phase. This phase when heated further can form α -TCP. The change phase HAp to TCP caused by the loss of OH groups (and releases water vapor) so HAp has dehydrated [9]. In order to obtain HAp with high density and stable, sintering is done to a certain temperature and maintained in order to avoid decomposition of HAp into β -TCP or other compounds. The sintering temperature is one factor that can affect the decomposition because the surface of HAp can active interact with the atmosphere around it at a certain temperature [10].

Heating temperature affects the crystallinity is formed. The more arrangement of atoms in a material orderly then more higher crystallinity. The more higher heating temperature caused the arrangement of atoms in the sample more regular so that more crystals formed.

Table 1 : Effect of variation temperature, stirring time and sintering time on the crystal size

Variation	$\cos \theta$	FWHM	β (rad)	Crystal size (nm)	
Temperature (°C)	20	0,9603	0,2728	0,0023	62,31
	40	0,9604	0,2740	0,0023	62,31
	60	0,9598	0,2709	0,0023	62,31
	80	0,9603	0,2829	0,0024	59,60
	100	0,9598	0,2772	0,0024	59,60

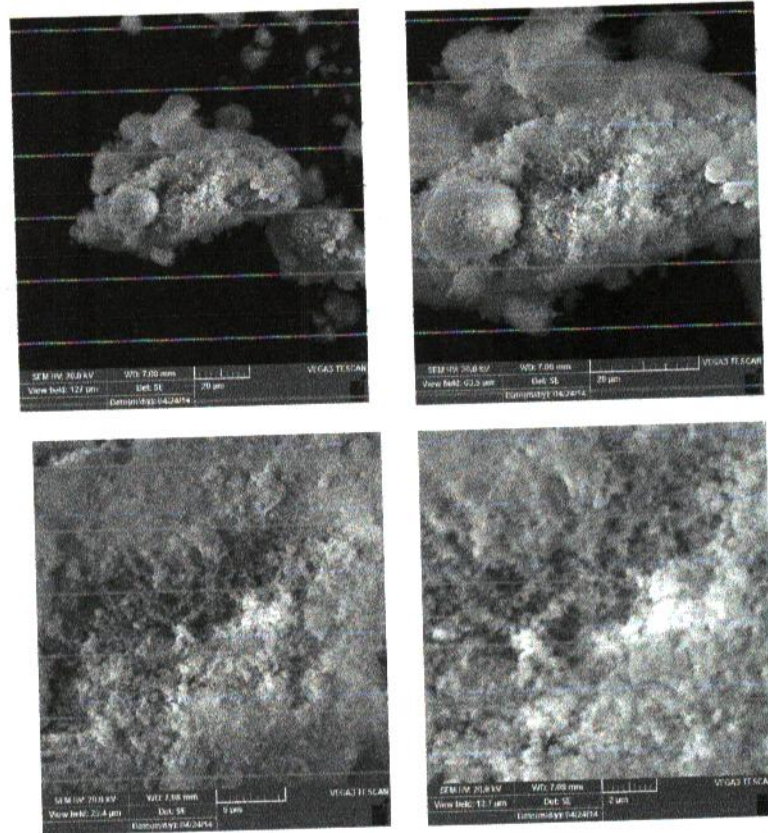


Figure 4 : Morphology of Nano Hydroxyapatite SEM test results

The result of micrographs at 40 °C in 5 hours stirring with 1 hour sintering time is obtained in the crystals form of some compound apatite are gathered with the form is not uniform, is smooth surface. Morphological observation used SEM (Figure 4) for the synthesized HAp particles having little bit of a problem because the particles undergo agglomeration, it is hard to know accurately of the morphology of single particles of HAp. HAp crystallites synthesized tend to form agglomerates. The SEM observations data is known that the morphology of the synthesized HAp particles appear round like a ball but can not be observed properly due to the agglomeration of the particles. SEM results of commercial HAp appearance granules that make up the aggregate. Granule size is uneven and has a smooth structure. These results indicate that the synthesis using precipitation method produces a perfect HAp^[4].

4. CONCLUSION

Synthesis of nano-hydroxyapatite prepared by precipitation method. Based on the XRD results, the overall diffractogram shows the phase of hydroxyapatite, but there are other phases such as α -TCP, β -TCP, AKA, and AKB. Synthesis results for the optimum temperature HAp synthesis is 40 °C at 800 °C sintering temperature is 2 hours with a particle size of 62.31 nm. For a long time the sintering time the particle size more increase. Based on SEM analysis, apatite compounds are assembled with a form was not uniform where a smooth surface due to



agglomeration. At the time of synthesis and screening process are kept to minimize contact with the air in order to obtain greater purity.

5. BIBLIOGRAPHY

- [1] Kumar, A., Ruban., Kalainathan, S., (2008). Growth and characterization of nano-crystalline hydroxyapatite at physiological conditions, *Res. Technol.* 43(6): 640 – 644.
- [2] Vallet-Regi, M. Gonzalez-Calbet, JM. (2004). Calcium phosphate as substitution of bone tissues. *Prog Solid State Chem.* 32: 1 – 31.
- [3] Cai., Liu Y., Yan W., Hu Q., Tao J., Zhang M., et al., (2007). Role of hydroxyapatite nanoparticle size in bone cell proliferation. *J Mater Chem.* 17: 3780 – 7.
- [4] Suryadi. (2011). Sintesis dan Karakterisasi Biomaterial Hidroksiapatit dengan Proses Pengendapan Kimia Basah. Tesis tidak diterbitkan Fakultas Teknik Universitas Indonesia. Depok.
- [5] Kementerian Peternakan Indonesia. (2012). Statistik Peternakan dan Kesehatan Hewan 2012. Direktorat Jenderal Peternakan dan Kesehatan Hewan. Jakarta.
- [6] Mahreni., Endang, S., (2012). Pembuatan Hidroksi Apatit Dari Kulit Telur. Tesis tidak diterbitkan Universitas Pembangunan Nasional “Veteran” Yogyakarta. Yogyakarta.
- [7] Dahlan K., Prasetyanti F., Sari YW., (2009). Sintesis Hidroksiapatit dari Cangkang Telur Menggunakan Dry Metode. *J. Biofisika* 5(2):71-78.
- [8] Aoki, H. (1991). *Science Medical Applications of Hydroxyapatite*. Tokyo: JAAS
- [9] Assolant DB., Ababou A., Champion E., Heughebaert M., (2002). Sintering of calcium phosphate hydroxyapatite $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ Calcination and particle growth. *J Eur Ceramic Soc.* 23:229-241.
- [10] Arifianto. (2006). Pengaruh Atmosfer dan Suhu Sintering terhadap Komposisi Pelet hidroksiapatit yang dibuat dari Sintesa Kimia dengan Media Air dan SBF. Skripsi Institut Pertanian Bogor. Bogor.