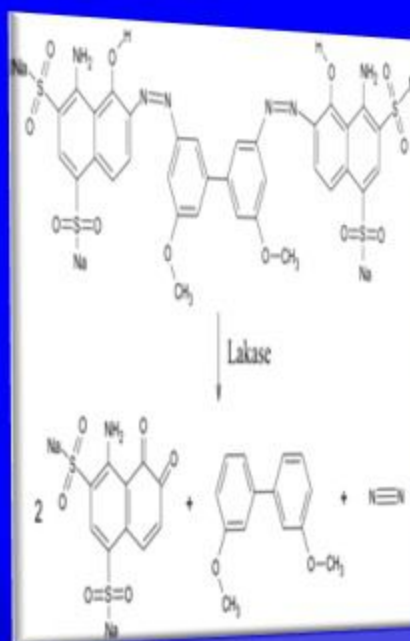
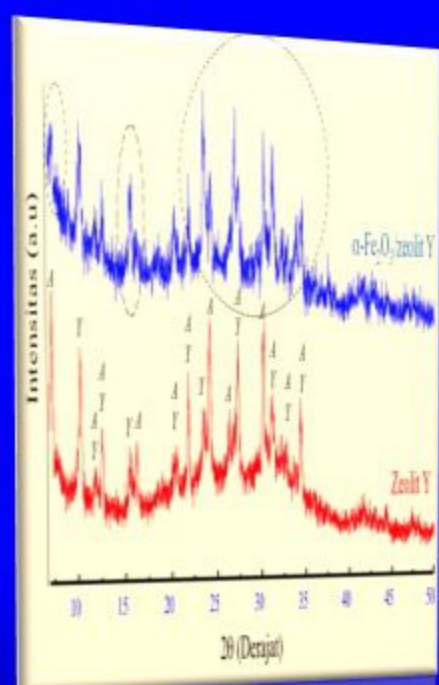


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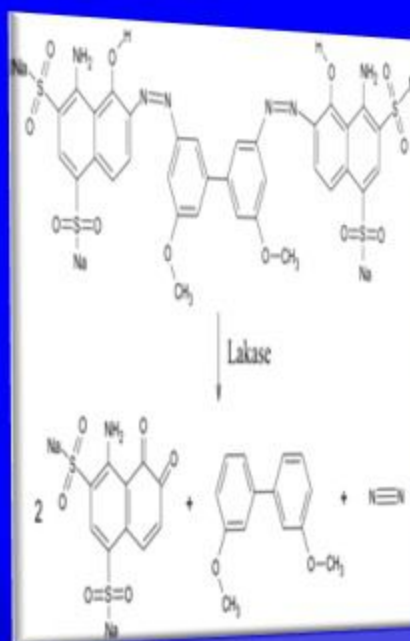
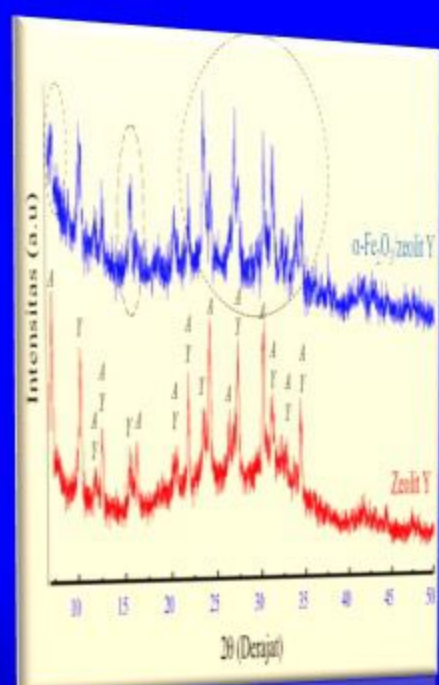
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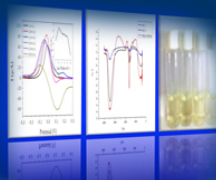
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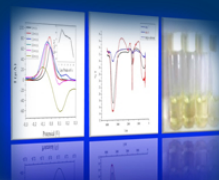
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00039642





## VOL 2, NO 2 (2017)

DESEMBER

### TABLE OF CONTENTS

#### ARTICLES

**REPARASI DAN KARAKTERISASI ALFA-Fe2O3 /ZEOLIT Y UNTUK REAKSI PERENKAHAN ASAM PALMITAT**

69-76

10.20473/jkr.v2i2.6166

Abstract views = 311 times | views = 642 times

*Abdulloh Abdulloh, Purkan Purkan, Nizar Hardiansyah*

**Membran Blend Kitosan/Poli Vinil Alkohol (PVA): Pengaruh Komposisi material blend, pH, dan Konsentrasi bahan Pengikat Silang**

77-85

10.20473/jkr.v2i2.6195

Abstract views = 399 times | views = 3496 times

*Bambang Piluharto, A Sjaifullah, I Rahmawati, Erix Nurharianto*

**EFEKTIVITAS KOMBINASI EKSTRAK DAUN SIRIH MERAH (Piper Crocatum) DAN EKSTRAK BIJI ALPUKAT (Persea americana) DALAM MENGHAMBAT PERTUMBUHAN Candida albicans**

86-92

10.20473/jkr.v2i2.6196

Abstract views = 943 times | views = 2255 times

*Vini Angraini, Masfufatun Masfufatun*

**Celery herb essential oil in the formulation of anti-dandruff hair tonic against Pityrosporum ovale**

93-97

10.20473/jkr.v2i2.6197

Abstract views = 471 times | views = 543 times

*Riska Surya Ningrum, Antonius Budi Prasetyo, Alfinda Novi Kristanti*

**OPTIMASI JENIS DAN KADAR SUMBER NITROGEN SERTA pH MEDIUM UNTUK PRODUKSI PROTEASE DARI ISOLAT HtCUM6.2.2 DARI TAUCO SURABAYA**

98-107

10.20473/jkr.v2i2.6307

Abstract views = 319 times | views = 765 times

*Monika Rahayu, Evi Susanti*

**POTENSI EKSTRAK METANOL DAUN MANGGA BACANG (Mangifera foetida L.) SEBAGAI ANTIBAKTERI TERHADAP Enterobacter aerogenes DAN IDENTIFIKASI GOLONGAN SENYAWA AKTIFNYA**

108-117

10.20473/jkr.v2i2.5753

Abstract views = 972 times | views = 2497 times

*Ely Setiawan, Tien Setyaningtyas, Dwi Kartika, Dian Riana Ningsih*

**The Influence of pH Values on the Crystallite Size of ZnO by Solvothermal Synthesis**

118-122

10.20473/jkr.v2i2.6430

Abstract views = 208 times | views = 203 times

*Ahmadi Jaya Permana, Dian Wulandari, Hartati Hartati, Harsasi Setyawati, Mochammad Zakki Fahmi*

**Gambaran Histopatologi Hepar Tikus Putih (Rattus norvegicus) yang Diinduksi dengan Parasetamol dosis Toksik Pasca Pemberian Ekstrak Etanol Daun Kelor (Moringa Oleifera)**

123-130

10.20473/jkr.v2i2.6700

Abstract views = 473 times | views = 4096 times

*Noer Kumala I*

**PENGEMBANGAN ELEKTRODA PASTA KARBON TERMODIFIKASI MIP DENGAN MONOMER ASAM METAKRILAT SEBAGAI SENSOR PADA ANALISIS KREATIN SECARA POTENSIOMETRI**

131-139

10.20473/jkr.v2i2.6699

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140-146

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3

H-Index

3

H5-Index

15

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15

5 Year Citations

## THE INFLUENCE OF PH VALUES ON THE CRYSTALLITE SIZE OF ZnO SOLVOTHERMAL SYNTHESIS

Ahmadi Jaya Permana\*, Dian Wulandari, Hartati, Harsasi Setyawati,  
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### Abstract

Zinc oxide (ZnO) is a semiconductor material that widely used in various applications due to its unique properties. Synthesis of ZnO by solvothermal method has been conducted with controlled pH values. The variations of pH value were 10, 11 and 12 by adjusting NaOH content. Crystall structure of the synthesis products after heat treatment at 110oC and 600oC has been characterised by X-ray Diffratometer (XRD). Crystallite size of ZnO was calculated by Scherrer equation. Crystall phase of ZnO has been observed on all pH value variations at 110 oC with 22,98-37,06 nm of crystallite size, whereas ZnO has been observed on all pH value variations at 600 oC with 41,39-71,77 nm of crystallite size.

**Keywords:** ZnO, pH values, crystallite size, solvothermal

### Introduction

Zinc oxide (ZnO) as semiconductor material has high stability in chemical, mechanical, photoradiation and thermal, board band gap energy and good in electrochemical and photochemical properties (Kołodziejczak-radzimska, 2014). As a semiconductor material, ZnO is widely used as promising materials for electronic and optoelectronic applications such as laser diodes, photoelectrodes, LEDs and gas sensors. Besides electronic application, ZnO is also catalyst that has lewis acid and basic for organic compounds synthesis (Kothandapani, 2016). In health and environmental application like medicine, biomedical diagnosis and therapy, water treatment, waste photodegradation, ZnO has antimicrobial (Król, 2017), antioxidant (Zare, 2017) and photocatalytic properties (Atchudan, 2017). According to versatile applications, ZnO is still attractive

materials to be investigated especially in synthesis development.

Synthesis of ZnO by solvothermal method is an alternative method to produce single-crystalline nanostructure, controlled size and shape (Rai, 2013). In addition, solvothermal synthesis is able to produce fine and uniform nanoparticle (Sari, 2015). This method performance is influenced by reaction environment such as precursor, solvent and additives (An, 2015). Precursor, solvent and additives affect microstructures, morphology and the properties of product (Zare, 2017). Synthesis of ZnO by solvothermal method basicly is conducted in base environment. As an important factor, the influence of pH on ZnO synthesis has been investigated in this work.

In this research, ZnO has been synthesized by facile solvothermal method in various pH then continued with heat treatment process at 110°C and 600°C. The influences of pH have been studied by X-

ray diffraction method to study the crystall structures and crystallite size. Crystallite size average was calculated using Scherrer method.

## Materials and Methods

### Materials

Zinc acetate dihydrate ( $\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$ , 99%), sodium hydroxide (NaOH, 98%), ethanol absolute were purchased from Sigma-Aldrich, that used without further purification.

### Methods

#### Synthesis of ZnO

Synthesis of ZnO has started by dissolving of 2 gram  $\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$  in 100 mL ethanol absolute until homogenous. The solution of NaOH 2 M in ethanol was then added drop wise into  $\text{Zn}(\text{CH}_3\text{COO})_2$  to adjust pH values to 10, 11 and 12 while still stirred constantly and heated at 75 °C for 8 hours. The mixtures were then digest at room temperature for 24 hours. The precipitates were formed during this process then filtered and washed with demineralised water. After this, the precipitates were heated at 110°C and 600°C for 5 hours, respectively.

#### Characterisation of ZnO

Phase and crystal structure was analyzed on a X-ray diffractometer (XRD) X'PERT-PRO PA using  $\text{CuK}\alpha$  radiation ( $\lambda = 1,5418 \text{ \AA}$ ) for  $2\theta$  values for 20-80°. Crystallite size was measured by X-ray peak profile analysis and calculated by Debye-Scherrer equation (Thomas, 2014).

$$D = \frac{K \lambda}{\beta_{hkl} \cos\theta} \quad (1)$$

where D is crystallite size, K is Scherrer constant equal to 0,90,  $\lambda$  is X-ray wavelength for  $\text{CuK}\alpha$  radiation equal to 1,5418 Å,  $\beta_{hkl}$  is full width at half maximum (FWHM) of XRD peak and  $\theta$  is diffraction angle.

## Results and Discussion

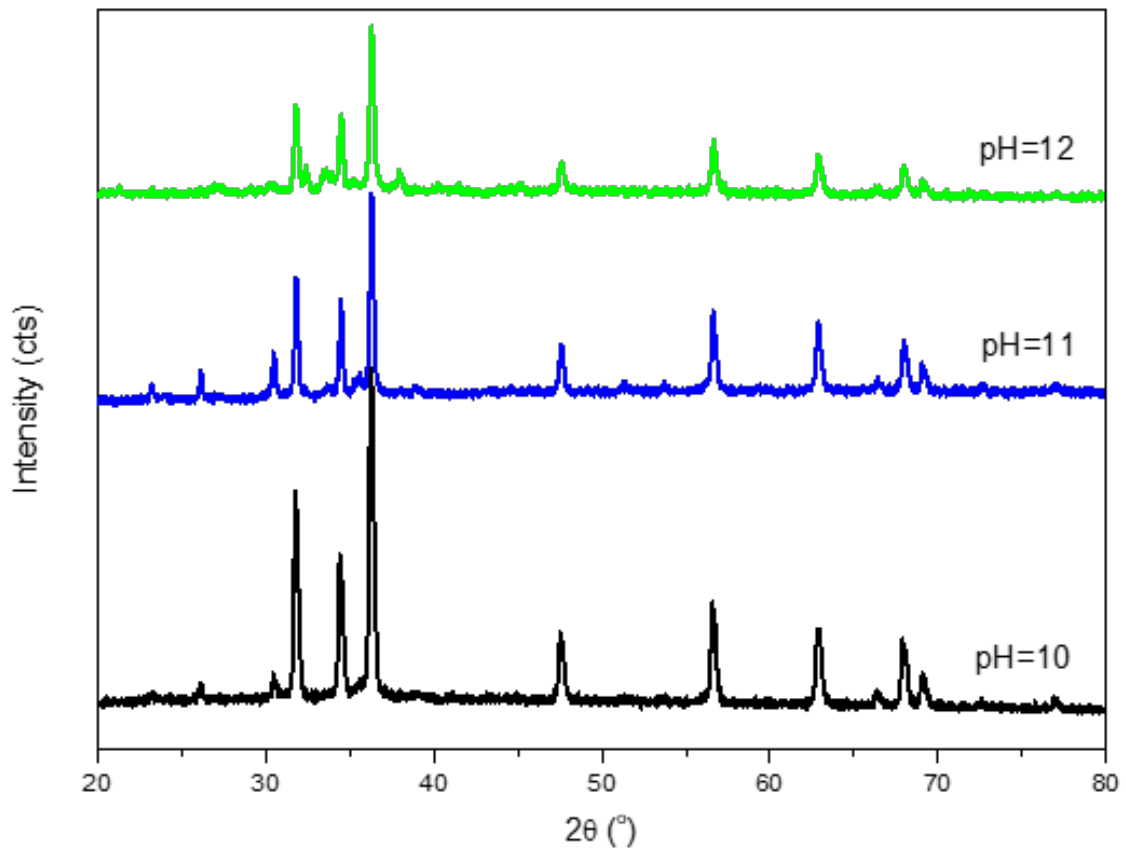
Herein, white powders of ZnO were successfully synthesised by solvothermal method at all variations of pH value and at all temperature heat treatment. These results are following precipitation reaction of  $\text{Zn}(\text{OH})_2$  then transformed to ZnO by heating process (Kołodziejczak-radzińska, 2014)

Elimination of  $\text{Na}(\text{CH}_3\text{COO})$  and  $\text{H}_2\text{O}$  as side products was conducted by washing and heating process so that can produce single product of ZnO. Figure 1 shows the diffractogram of ZnO with similar XRD peaks pattern of all pH variation at 110°C. The XRD peaks pattern are indexed to JCPDS 36-1451 that confirm the hexagonal wurtzite phase of ZnO. There are no other crystalline phase detected that mean this synthesis method produce single crystalline phase of ZnO. Besides all pH variation show similar pattern, the XRD peak intensity ratio are quite similar at all pH variations

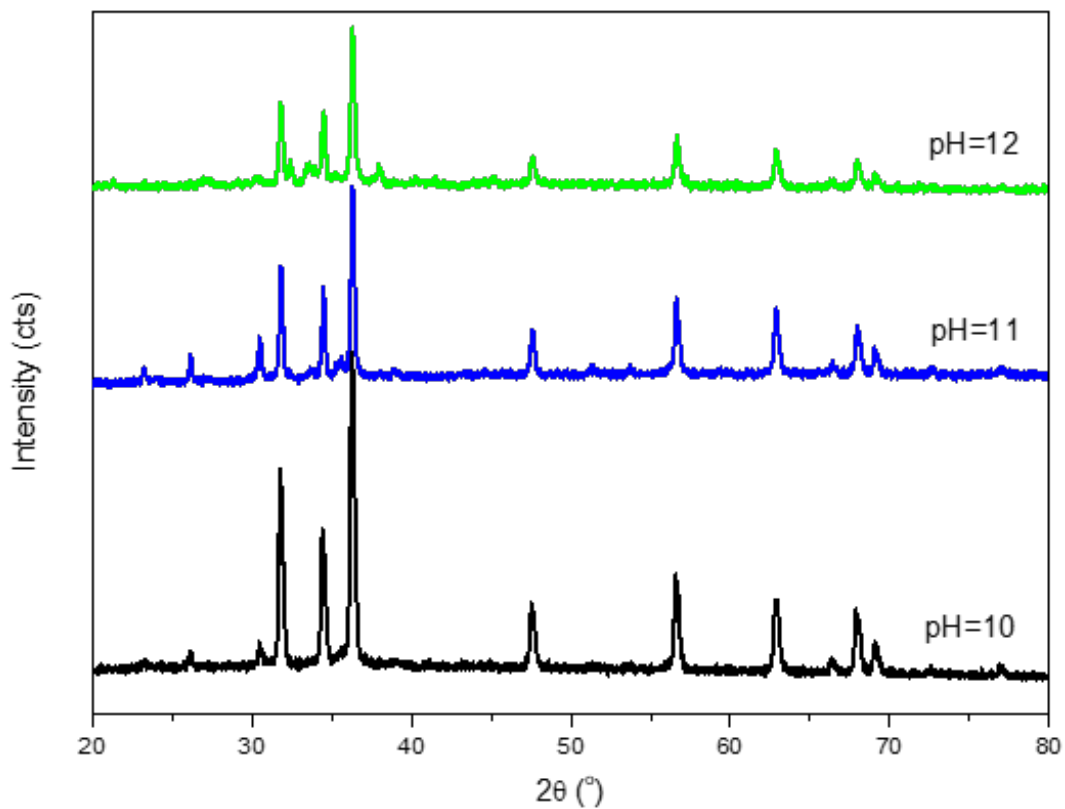
Single crystallinity of hexagonal wurtzite phase of ZnO showed on Figure 2. Peak intensity of XRD increased at all pH value along the increasing of temperature from 110°C to 600°C. Similar results with heat treatment at 110°C, XRD peak intensity ratio are quite similar at all pH value that indicates similar shape and morphology formation (Jaimeewong, 2016)







**Figure 1.** XRD diffractograms of ZnO products of different pH variation at 110°C



**Figure 2.** XRD diffractograms of ZnO products of different pH variation at 600°C

**Table 1.** Crystallite size average of ZnO

Temperature (°C)	Crystallite Size Average (nm)		
	pH =10	pH = 11	pH =12
110	22,98	37,06	26,12
600	71,77	54,23	41,39

The influence of pH value variations to crystallite size of ZnO can be observed on Table 1. At 110°C, there are no correlation results about the influence of pH value to ZnO crystallite size due to the difference of products transformation to ZnO. The product formation before heat treatment at pH 10 are dominantly Zn(OH)<sub>2</sub>, product at pH 11 are dominantly Zn(OH)<sub>2</sub> and Zn(OH)<sub>3</sub><sup>-</sup> and product at pH =12 are dominantly Zn(OH)<sub>3</sub><sup>-</sup> (Pandit, 2017). The increased of heat temperature increase the crystallite size of ZnO because the increased of aggregation process (Jaimeewong, 2016). The influence of pH value observed the decreased of the crystallite size from 10 to 12. The function of NaOH on solvothermal method as mineraliser and catalyst (An, 2015) can be

the reason about the decreased of the crystallite size.

### Conclusions

To conclude, ZnO have successfully been synthesized by solvothermal method. ZnO were formed in all of pH values variation at both 110°C and 600°C temperature of heat treatment. Synthesis of ZnO at pH = 10 at 600°C resulted highest XRD peak intensity and greatest crystallite average size to 71,77 nm.

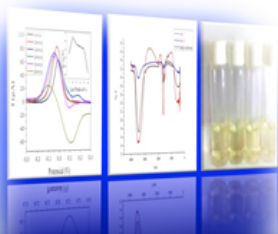
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### References

- An, A., Marin, M., Crnjak, Z., and Majda, Ž. (2015). Basic zinc carbonate as a precursor in the solvothermal synthesis of nano-zinc oxide, *86*, 347–353.  
<http://doi.org/10.1016/j.matdes.2015.07.087>
- Atchudan, R., Nesakumar, T., Immanuel, J., Perumal, S., Shanmugam, M., and Rok, Y. (2017). Journal of Photochemistry and Photobiology A: Chemistry Direct solvothermal synthesis of zinc oxide nanoparticle decorated graphene oxide nanocomposite for efficient photodegradation of. *Journal of Photochemistry and Photobiology, A: Chemistry,* *337*, 100–111.  
<http://doi.org/10.1016/j.jphotochem.2017.01.021>
- Jaimeewong, P., Promsawat, M., Jiansirisomboon, S., and Watcharapasorn, A. (2016). Surface and Coatings Technology Influence of pH values on the surface and properties of BCZT nanopowders synthesized via sol-gel auto-combustion method. *Surface and Coatings Technology, 306*(3), 16–20.  
<http://doi.org/10.1016/j.surfcoat.2016.03.091>
- Kołodziejczak-radzimska, A., and Jesionowski, T. (2014). Zinc Oxide—From Synthesis to Application: A Review, 2833–2881.  
<http://doi.org/10.3390/ma7042833>

- Kothandapani, J., Ganesan, A., and Kumar, G. (2016). Zinc oxide surface : a versatile nanoplatform for solvent-free synthesis of diverse isatin derivatives. *Tetrahedron Letters*, 57(31), 3472–3475. <http://doi.org/10.1016/j.tetlet.2016.06.094>
- Król, A., Pomastowski, P., Ra, K., and Buszewski, B. (2017). Zinc oxide nanoparticles : Synthesis antiseptic activity and toxicity mechanism. <http://doi.org/10.1016/j.cis.2017.07.033>
- Pandit, A. B., and Badnore, A. (2017). Effect of pH on sonication assisted synthesis of ZnO nanostructures : Process details Corresponding author. *Chemical Engineering and Processing: Process Intensification*. <http://doi.org/10.1016/j.cep.2017.09.013>
- Rai, P., Kwak, W., and Yu, Y. (2013). Solvothermal Synthesis of ZnO Nanostructures and Their Morphology-Dependent Gas-Sensing Properties.
- Sari, A., Stefani, G., and Dra, G. (2015). Solvothermal synthesis of zinc oxide microspheres, 652, 91–99. <http://doi.org/10.1016/j.jallcom.2015.08.200>
- Thomas, P. B. S. (2014). Estimation of lattice strain in ZnO nanoparticles : X-ray peak profile analysis, 123–134. <http://doi.org/10.1007/s40094-014-0141-9>
- Zare, M., Namratha, K., Byrappa, K., Surendra, D. M., Yallappa, S., and Hungund, B. (2017). Surfactant assisted solvothermal synthesis of ZnO nanoparticles and study of their antimicrobial and antioxidant properties. *Journal of Materials Science and Technology*. <http://doi.org/10.1016/j.jmst.2017.09.014>



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4

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