

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

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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-radzińska, 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-