United Journal of Chemistry
An International open access

ISSN: 2581-7760
CODEN: UJC
www.unitedjchem.org
Volume 1; Issue; 2 December 2018; Page No. 188-190

Low Temperature Photosynthesis of Bi_2O_3 Nano Powder

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Abstract:

Using photolysis method, bismuth oxide particles in the nano range were successfully prepared. The results showed prepare particle with high purity and this indicate the importance of this method. The synthesized particles characterized using XRD and AFM techniques. The results from XRD obtain prepared alpha phase with monoclinic structure while AFM result showed synthesis particles with 38nm average.

Keywords:
Novel, photolysis, nano, powder, XRD

INTRODUCTION

Wide applications for Nano Bi_2O_3 were used as a catalyst, capacitor, additive in paints and gas sensors. Because of the compounds of Bi_2O_3 has structure face-centered cubic, it has high conductivity compare with all conductors oxides and it is the best solid electrolytes. Four phases of Bi_2O_3 were existed: α, β, λ and . Many methods were used to prepare it such as sol gel, chemical precipitation and hydrothermal methods[1-5]. In this paper, a new method was studied to prepare the particles called photolysis method. According this method, UV irradiation[6-11] works as a reduction reagent to prepare the nano surface.

EXPERIMENTAL

Characterization

AFM and XRD were used to character the image surface, average and crystal system of the nanoparticles.

Synthesis of Bi_2O_3 nanoparticles

5 g of bismuth chloride dissolved in 100ml of ethanol and photolysis it using irradiation system as shown in figure 1 for 2hr until brown precipitate appear. After that, burned the precipitate for 1hr at 400C until yellow powder appears.

RESULT AND DISCUSSION

The average of particles appeared in figure 2. The results show prepare particles in nano range.

The crystal size of nanoparticles was determined by using Debye-Scherrer formula by following equation[12]:

$$D = k \lambda / \beta \cos\theta$$

Where is the wavelength of the Cu-Kα radiations, k scherrer constant, β is the full width at half maximum and θ is the angle obtained from 2

(Received: October 12, 2018; Accepted: November 29, 2018)
Volume 1; Issue; 2 December 2018; Page No. 188-190
www.unitedjchem.org

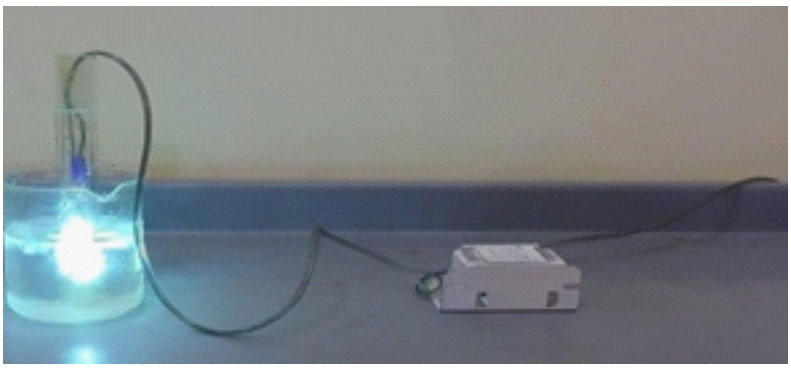

Fig. 1: Irradiation system (125W)

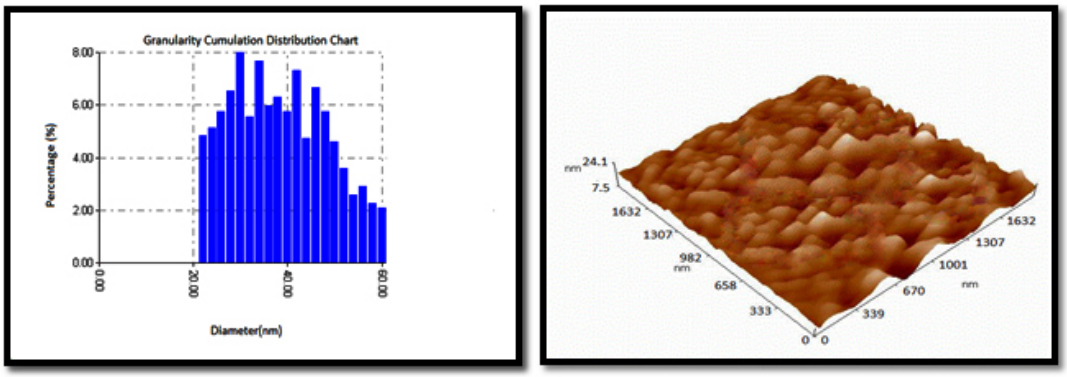

Fig 2: 3D image of AFM and granularity cumulative distribution chart for α-Bi_2O_3

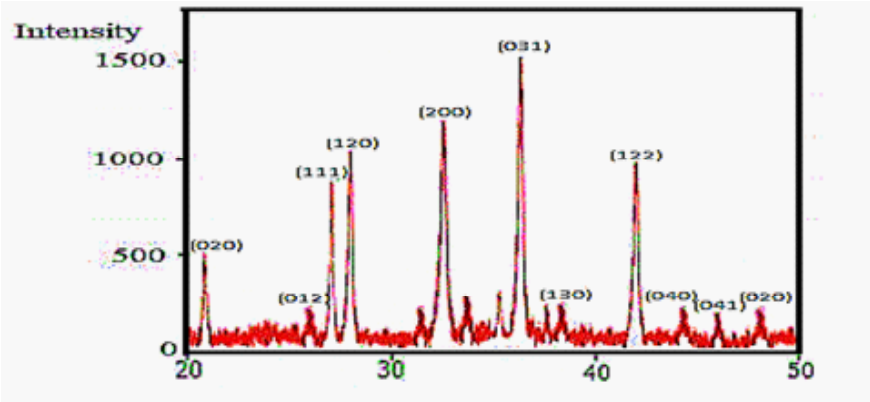

Fig. 3: XRD of α-Bi_2O_3

values corresponding to maximum intensity peak in XRD pattern. The result from equation show prepare particle in nano size (30nm).

The structure of alpha phase of bismuth oxide nanoparticles was characterized by using XRD technique that prepared by photolysis methods. Fig 3 was shown the pattern of alpha phase and miller index of the powder and it showed that the nanoparticles have monoclinic structure according standard card (JCPDS 00-041-1449).

CONCLUSION

By simple photolysis method, bismuth oxide nanoparticles have been successfully prepared. The checking of the AFM and XRD were showing us the composition of -Bi_2O_3 with 38nm.

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