SIIC054

A Comparative Study on The Effect of Tin Precursor Concentration on The Tin(IV) Oxide Nanoparticles Growth and The Photocatalysis Properties

Shahida Binti Ismail[1] and Vicinisvarri Inderan[2]
[1]*Faculty of Chemical Engineering, Universiti Teknologi MARA Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang Malaysia*
[2] *Faculty of Chemical Engineering, Universiti Teknologi MARA Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang Malaysia*

**Corresponding author: vicinisvarri@ uitm.edu.my*

Abstract:
The studies of SnO_2 in photocatalysis application are still limited and are not widely investigated. Improvement in the fundamental knowledge of SnO_2 as photocatalyst as well as its structural and morphology was done through further studies of the SnO_2 characterization. Nanostructured of SnO_2 can be schemed by controlling the parameters that affecting the morphology of the materials. There are several parameters like temperature, pH, concentration, and duration of hydrothermal process that can influence the structure and morphology of SnO_2. Therefore, an investigation on the effect of tin precursor concentration on the tin(IV) oxide nanoparticles was carried out. The characterization data of as-synthesized SnO_2 used in this study were determined using hydrothermal method before proceeding to the analysis.Based on FESEM analysis, the morphology of tin oxide from cluster of irregular shape at 0.08 M developed to nanorods structured at 0.2 M as the precursor concentration increases. Based on the data analysis tin(IV) oxide prepared with 0.12 M shows well formation of dimensional nanostructure. The best selected sample (0.12 M) was tested on Methylene Blue dye (6 ppm) for photocatalytic degradation. The data analysis shows that 15 minutes is required to achieve 84.75 % degradation and 105 minutes for 100 % degradation of methylene blue. At optimum concentration , the well-ordered of the structured increase the surface area, hence the active sites increase for catalytic rection to occur. Thus, the concentration of tin precursor can affect the morphology of the tin(IV) oxide and also the photocatalysis performance.

***Keywords*:**
Hydrothermal method ; Tin(IV) oxide; Photocatalysis; Concentration of precursor; Methylene blue

Objectives:

- To analysis the characterization data of SnO_2 synthesized via hydrothermal treatment.

- To evaluate the performance of the selected as-synthesized SnO_2 on the photocatalytic reaction using methylene blue.

Methodology:

The morphology of the sample coated with a thin layer of gold is scanned with FESEM (LEO 1525, 30 kV New York). The presence of the coated layer on the samples increase the electron conduction and improve the quality of image. The image obtained will be compared based on the morphology of the nanostructure. The photocatalytic activity is prepared by as-prepared sample and it was disperse in a 6ppm of methylene blue. The suspension is stirred in dark condition 30 minutes to achieve equilibrium adsorption on the catalyst surface. The suspension bring under sunlight with the range of illumination of sunlight at 800 to 1000 W/m^2. The The graph of R% refer to degradation of dye versus irradiation time (t) will be plotted to observe the degradation of methylene blue using tin(IV) oxide as a catalyst. The percentage efficiency of photodegradation of the dye is calculated using the Equation below.

$$R\%\ degradation = \left[\frac{C_0 - C_t}{C_0}\right] \times 100\%$$

Where, C_0 is an initial concentration and C_t is the concentration at time interval every 15 minutes.

Results:

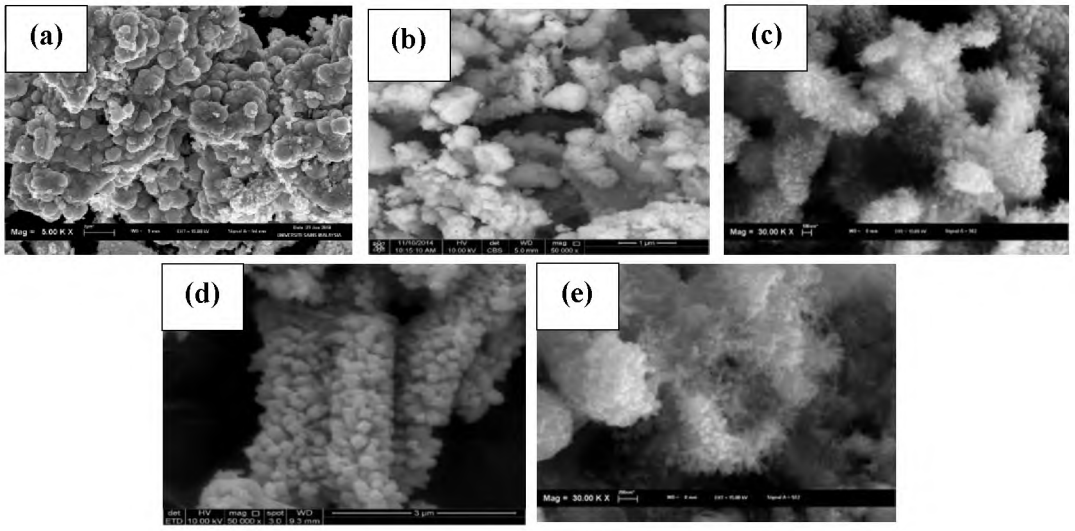

Figure 1 : FESEM images at different precursor concentration a) 0.04 M b) 0.08 M c) 0.12 M d) 0.16 M, and e) 0.2 M

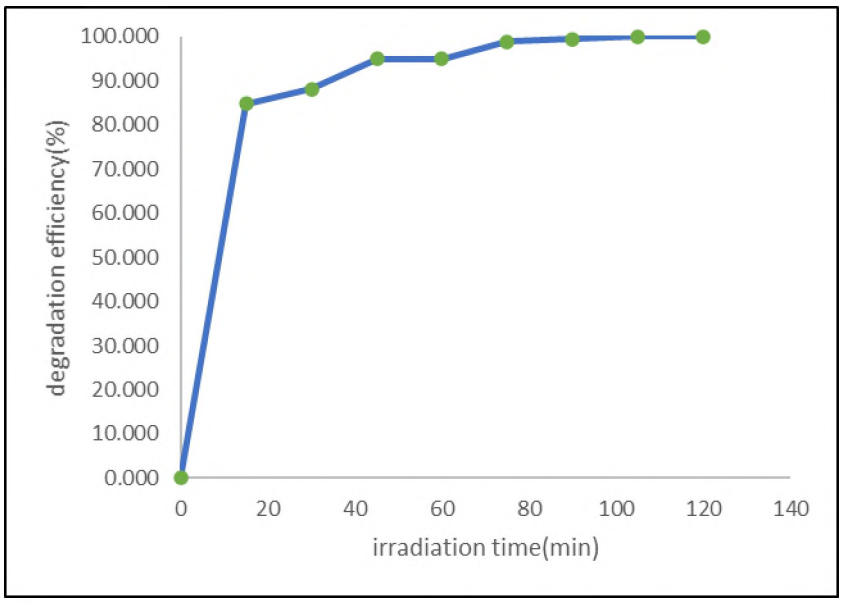

Figure 2: Photodegradation efficiency of methylene blue under sunlight irradiation.

Conclusion:

A comparative study on the effect of tin precursor concentration on the tin(IV) oxide nanorods and the photocatalysis properties was successfully carried out. Prior to the data analysis the SnO_2 sample was synthesized at 180°C for 24 hours *via* hydrothermal method by supervisor. Based on the FESEM analysis, 0.12 M has the optimum condition as well-formed nanorod structure (1-D) was obtained compared to the 0.04 M, 0.12 M, 0.16 M, and 0.2 M precursor concentration. The photocatalytic degradation of well-formed nanorod at 0.12 M achieved 84.75 % and 100 % of dye at 15 minutes and 105 minutes respectively. Synthesized of SnO_2 with surfactant as a template show a higher degradation of dye compare to preparation of SnO_2 without surfactant. Thus, the concentration of precursor will affect the nanostructure, morphology, and also the photocatalytic activity of SnO_2.