EFFECT OF PRECIPITATING AGENT ON THE CATALYTIC ACTIVITY OF $Fe_{3-X}Co_XO_4$ CATALYST

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2017

AUTHOR'S DECLARATION

I declare that the work in the thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the results of my own, unless otherwise indicated or acknowledge as reference work.

I, hereby acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ACKNOWLEDGEMENT

First and foremost, I would like to say ‘Alhamdullilah’ praised to Allah for the ease of my final year project, which enables me to complete my report within the given time of two semesters. The satisfaction, which accompanies the succesful completion of the project, it is incomplete without the mention of a few names. I take this opportunity to acknowlede the efforts of the many individuals who helped me make this project possible.

I would like to express my heartfelt appreciation and gratitude to my supervisor and co-supervisor, Rasyidah Alrozi and Dr Nor Aida Bt Zubir also to Mohammad Khairul Azam Selamat. This project is a result of their teaching, encouragement and inputs in the numerous meetings shehad with me, despite their busy schedule. In addition, I would like to express my special thanks to both of my parents, Mr Paisan Hj Ental and Madam Rokiah Hj Sahdan for giving me a lot of encouragement during the process of my final year project one.

The experience was novel one and I would like to thank all the people who have lent their valuable time in helping me on completion of the report. Without their consideration it would have been difficult to complete the study.

ABSTRACT

This research work focuses on the investigation on effect of precipitating agent on the catalytic activity of $Fe_{3-x}Co_xO_4$. The catalyst is synthesized by co-precipitation method where using two (2) different precipitating agents i.e. sodium hydroxide (NaOH) act as a strong base and ammonium hydroxide (NH_4OH) act as a weak base. Precipitation agent plays a key role in precipitating the resultant catalyst, which in turn will lead to different in physico-chemical properties of $Fe_{3-x}Co_xO_4$ catalyst. The oxidative degradation of the AO7 is performed using heterogeneous Fenton-like reaction in order to evaluate the catalytic activity of synthesized catalyst. The physical properties of resultant $Fe_{3-x}Co_xO_4$ catalyst were characterized using N_2 sorption and XRD respectively. The results of catalytic and adsorption test shown catalytic test have higher yield of degradation in AO7 dye due to the presence of active •OH radicals from the decomposition of H_2O_2. Nanoparticles of $Fe_{3-x}Co_xO_4$ lead to a dense structure when the molarity of the bases increased. The pore size at 1M, 3M and 5M of $Fe_{3-x}Co_xO_4$ (NH_4OH) were 6.41 nm, 3.08 nm and 3.06 nm respectively whereas for $Fe_{3-x}Co_xO_4$ (NaOH) were 8.22 nm, 8.15 nm, 8.49 nm respectively as formed with 1M, 3M and 5M. XRD characterization was carried out to determine the phase purity of $Fe_{3-x}Co_xO_4$ catalysts. The orientation of the particles in the catalyst has a strong effect on the intensities where sometimes the particles are needles or plateles that are somewhat aligned. A low shape peak indicates the particles were randomly oriented and the missing of cobalt ferrite phase in XRD patterns at NaOH due to an even dispersion of Co^{2+} species and clusters finely dispersed on the cobalt ferrite. However, as for 1M of NH_4OH there was only iron oxide was formed without any other impurities due to the tendency of NH_4OH to produce agglomeration was very high. Thus, the Co^{2+} substitution was not presence in the iron oxide itself. As a conclusion, it is shown that strong base was better in synthesizing the catalyst compared to the weak base in order to obtain a better degradation of dye and a better substitution of Co^{2+} ion to enhance the catalytic activity.