EFFECT OF CALCINATION TEMPERATURE OF ZINC OXIDE CATALYST IN PHOTOCATALYTIC DEGRADATION OF 2,4,6-TRICHLOROPHENOLS USING UV LIGHT

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ABSTRACT

2,4,6-Trichlorophenols (2,4,6-TCP) is one of the chlorophenols compound that have a highest toxicity. It carcinogen to human could cause blood and liver cancer throughout the drinking water and foods. Thus, the photocatalytic degradation of 2,4,6-TCP by using UV light and enhance by using Zinc Oxide are needed. The effect of different concentration of 2,4,6-TCP which are 10 ppm and 40 ppm and calcination temperature of catalyst i.e 400^{o}C, 500^{o}C and 600^{o}C were investigated. The characterization of ZnO at different calcination temperature was performed by using Thermogravimetric (TGA) and Brunauer-Emmett-Teller (BET) analysis. The percentage degradation was measured by using HPLC instrument after exposed the 2,4,6-TCP at concentration of 10 ppm and 40ppm with ZnO catalyst under UV light for 6 hours. Therefore, the results show the weight loss and BET surface area decreased as the calcination temperature increased which is from 400^{o}C to 600^{o}C attribute to high thermal stability and has agglomerated particles in ZnO. The optimum degradation of 2,4,6-TCP for 10 ppm is 97.54% at 4 hours while for 40 ppm is 96.83% at 6 hours exposed to UV light at 600^{o}C of calcination temperature of Zinc Oxide. It shows that ZnO catalyst at high calcination temperature lead to more effective in photocatalytic degradation of 2,4,6-TCP under UV light.

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

In 1950, the first reported production of 2,4,6-Trichlorophenols (2,4,6-TCP) was at United States (IARC 1979). Unfortunately in 1975, the product of 2,4,6-TCP was not produce anymore due to the cost of removing chlorinated dibenzo-p-dioxins which exist as toxic impurities is high (HSDB 2009). Next, in year 2009 the production of 2,4,6-TCP continue produce by one manufacturer each in China, India and Europe. 2,4,6-TCP is one of the chlorophenols compound which is resistant to biodegradation and continue in the environment for long duration of time. They are one of the largest numbers of group of industrial toxic compound and usually found in industrial wastewaters like pulp and paper, dye and pigment, pharmaceuticals and municipal waste incineration (Ghanbari et al. 2016). They could be separated by wind and water. Besides that, they could grow and released from one species to the next through the food chain. Therefore, chlorophenols are recognized as environmental pollutants owing to their high potential of phytotoxicity and zootoxicity (Gaya et al. 2010). Hence, the cholorophenols compound which is in the aqueous systems has to be converted into a nontoxic species or less harmful species.

The uses of 2,4,6-TCP usually in many type of pesticide formulations and as a wood preservative. For example, the used of 2,4,6-TCP is in pesticide like fungicides, bactericide, herbicides and as glue preservative while in textile as anti-mildew agent (IARC 1979, HSDB 2009) but most of the uses this compound is terminated in United State. In ambient air, this compound was detected at very low