PREPARATION OF HYBRID CuO/TiO_2 PHOTOCATALYST RESPONSIVE TOWARDS UV-LIGHT (EFFECT OF INCUBATION TIME)

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ABSTRACT

Large amount of synthetic dyes are produced and consumed especially in a textile industry. Hence, Titanium dioxide (TiO_2) photocatalyst is one of the promising methods used in the treatment of dye removals. However, it has to be doped with other metals such copper oxide (CuO) to increase the efficiency under UV-light. This study was carried out to prepare hybrid CuO/TiO_2 using wet impregnation method by varying the incubation times at 1, 2, 4, 8 and 24 hr at 0.5wt% of copper concentration and 50°C of incubation temperature. The next objective is to study the application of hybrid photocatalyst produce for degradation of dye in wastewater. Then, characterization of the photocatalyst was done by XRD, EDX, FESEM and BET analysis. Hybrid photocatalyst sample was prepared using Copper (II) acetate monohydrate as the precursor for copper loading. Photocatalytic degradation for 10 ppm of methyl orange was studied under UV-light irradiation and the extent of dye degradation was determined using UV-Vis Spectrophotometer. Thus, from the characterization analysis, XRD patterns exhibited strong diffraction peaks of pure anatase TiO_2. The copper loading cannot be detected by XRD analysis due to the low amount of copper content and beyond equipment limit but it can be found via EDX. The surface morphologies of bare TiO_2 and CuO/TiO_2 photocatalyst were studied by FESEM and indicated the relative uniform distribution of CuO on TiO_2. Apart from that, BET result showed no significant change on the surface area, pore volume and pore width for bare TiO_2 and hybrid CuO/TiO_2 photocatalyst. Then, the result for the photocatalytic activity showed that the sample being incubated at 2 hr during preparation of hybrid photocatalyst is an optimal result as it showed the best decolourization results with 82.06% of methyl orange removal.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Nowadays, environmental pollution is one of the critical problems faced by many countries all over the world. It can be the biggest global killer which affecting over a billion people each year. There are several types of environmental pollution such as air pollution, land pollution, water pollution, thermal pollution, noise pollution and many more. According to the World Health Organization, almost 25 percent of all deaths in the developing world are directly attributable to the environmental factor.

Among all of the types of environmental pollution, water pollution is on the rise globally. In recent times, the world has to face enormous challenges on clean water shortage due to water pollution. The development of industries such as textile, paper, plastics, paint, leather, food, medical and cosmetics become a major contribution to this issue. This is due to the fact that this kind of industries uses synthetic dye for dyeing their products and thus is involve with the removal of inorganic pollutants into the source of water such as river, lake, sea and others. In fact, the presence of even trace concentration of dyes in effluent streams causes harmful to human health and aquatic life such as plants, microbe and animals in water due to their toxicity, hazardous and non-biodegradable nature. The effect of these kinds of inorganic effluents in the wastewater can be identified by the change in the vital parameter of the effluent water such as biological oxygen demand (BOD), chemical oxygen demand (COD), turbidity and odor of water (Gnanaprakasam et al., 2015).