CHAPTER I
INTRODUCTION

I.1. Background

Organic dyes is commonly used in textile coloring, such as gentian violet (GV), methyl violet (MV), Methylene Blue (MB), Fuchsin Basic (FB), Safranin T (ST), and Rhodamine B [1]. In the fabrication of textile, coloring process produce huge amount of wastewater contained at least one of these organic dyes, which is difficult for natural degradation. As a result the concentration of organic dyes in the water body is increasing. On the other hand, these organic dyes may cause harm effects on ecosystem and human health, such as carcinogenic, irritation, cyanosis if inhaled, and reactive on human skin.

There are various kinds of wastewater treatments for textile industry such as membrane separation, chemical precipitation, electro deposition, ozonolysis, reverse osmosis [2, 3] and adsorption. Compare to those process, adsorption has several advantages such as low cost, high efficiency of removal, and simple equipment. The adsorption also has disadvantage, it just effective in low concentration.

In adsorption type of adsorbent, effect of pH and effect of temperature are crucial for process efficiency. Good adsorbent has the following characteristics, such as high adsorption capacity, large surface area, insoluble, may not engage in chemical reactions with the substance to be purified, easy regenerated, and non-toxic [4]. pH is regarded as an important parameter because it can control the absorption mechanisms adsorbate as well as influence the adsorption test. Temperature has two major effect on the adsorption process, increasing the temperature induces in the diffusion rate of adsorbate molecules onto adsorbent surface and enhances the equilibrium

adsorption capacity for the particular adsorbate. Bentonite as adsorbent has been used for the adsorption of Methylene blue, Naphtol blue black dye, Congo red, Methyl orange, and many organic dyes. Natural bentonite is good adsorbent because it can adsorb the organic dyes up to 92.2% [5]. Adsorption capacity of bentonite can be increased by physical or chemical modification. Physical adsorption occurs when molecules of gas or liquid is contacted with a solid and a portion of the molecules condense on the surface of solids are used to absorb, while the chemical adsorption occur when a chemical reaction between the molecules of adsorbate with adsorbent surface.

The bentonite modified TiO_2 can adsorb organic dyes up to 99.4% [5]. Adsorption process is not effective if only uses bentonite as adsorbent, because the process can only be used once, then the adsorbent is impregnated using TiO_2 as a photocatalyst that can increase the adsorption capacity by several times.TiO_2 has been the most widely used for wastewater treatment because of its strong oxidizing [6, 7] properties for the removal of organic pollutants, super hydrophilicity and chemical stability.

The addition of Ca-Bentonite materials to various concentration TiO_2 photocatalyst was initially presented using directly simple mixtures by impregnation method. TiO_2/Ca-bentonite product will be used as photocatalyst to degrade various concentrations of Methylene blue and Rhodamine B under UV radiation each 10 minutes until 2 hours. UV-light is necessary to create the hole-electron pairs needed for the photocatalytic reaction which limits their use in environmental applications. And for another step the TiO_2/ Ca-bentonite product will be radiated by UV radiation, then the various TiO_2/Ca-bentonite is used as adsorbent to adsorb Methylene blue and Rhodamine B at various mass composite and temperature. This

experiment data will be evaluated by Langmuir and Freundlich adsorption isotherms.

I.2. Objectives

- To study the effect of mass ratio TiO_2 and bentonite in the preparation of adsorbent composite for cationic dyes adsorption in various temperature, pH, and with/without UV irradiation on the adsorption capacity.
- To study the characterization of bentonite-TiO_2 composite (functional group).

I.3. Problems Limitation

Cationic dyes used in this study represented by Methylene Blue and Rhodamine B.