CHAPTER I
INTRODUCTION

I.1. Background

Dyes are commonly used in textiles, cosmetics, papers, and printing. These industries used huge amount of dyes daily. Dyes consist of two main groups of compounds — chromophores and auxochromes. Chromophores determine the color of the dye while the auxochromes determine the intensity of the color (Moussavi and Mahmoudi, 2009). Both compounds are very difficult to degrade since they are recalcitrant organic molecules, resistant to aerobic digestion and stable to light (Garg et al., 2003). The existence of dyes in water body even in low concentration is highly visible and poluted the water environtment. Moreover, the amount of dyes release in enviroment is very high, which cause serious water pollution. With these concerns, more and more efforts have been focused on the removal of dyes from water environtment (Rafatullah et al., 2010, Robinson et al., 2001).

There are many methods to treat dyes pollutants, such as adsorption, adsorption on activated carbons, coagulation and flocculation (Shi et al., 2007), reverse osmosis (Al-Bastaki, 2004), activated sludge (Jr. et al., 2005), bacterial action (Banat et al., 1996), chemical oxidation (Arslan et al., 2000), ozonation (Wang et al., 2003), and physical methods like membrane filtration (A.Akbari et al., 2002), ion exchange (Banerjee and Chattopadhyaya, 2013) and electrochemical techniques (S.Raghu and Basha, 2007) are either expensive or ineffective (Popuri et al., 2009). Among these methods, adsorption is still the cheapest and most effective process (Kurniawan et al., 2012, Rahardjo et al., 2011, Zhou et al., 2012). The important properties of adsorbent are porosity, adsorption capacity of adsorbate concentration, balance between macro-pores and micro-pores, thermal stability, cyclic regeneration, pressure drop, and cost for acquisition of adsorbent. There are many comercially natural adsorbents available have a low adsorption capability, so that the surface modification needs to be done to increase the adsorption capacity. Modifications are made by using surfactans (Kurniawan et al., 2012), natural polymer (Bhattacharyya and Ray, 2014), metal oxidation (Ghanbari, 2014), and others (Ismadji, 2015).

Bentonite has been used for the removal of various hazzardous substances from water or wastewater by many researches, such as 3,723 mmol/g of acid green 25 (Koswojo et al., 2010); 0,0545 mmol/g of ampicillin (Rahardjo et al., 2011); 2,965 mol/g of acid scarlet (Zhou et al., 2012); 47,3715 mg/g of amoxicillin (Putra et al., 2009). In this study, a new adsorbent synthesized from clay mineral and natural polymer, namely bentonite and alginate. Nanocomposite bentonite-alginate are biocompatible and biodegradable, and be functional in relevant fields as heterogeneous catalysts, chemical sensors and as active components in optical, magnetic and electrochemical devices, and bioplastics (Benhouria et al., 2015). Bentonite-alginate nanocomposite is characterized by using FTIR. That nanocomposite is conducted to determine the adsorption optimization in crystal violet dye by adsorption methods as a waste dye model at a room temperature.

I.2. Research of Objectives

1. To study the effect of mass ratio of bentonite and alginate in the preparation of adsorbent composite for cationic dyes adsorption in various temperature on the adsorption capacity
2. To study the characteristic of bentonite-alginate nanocomposite

I.3. Problem Limitations

Cationic dyes used in this study represented by Crystal Violet