CHAPTER I

INTRODUCTION

1.1. Rational

The aromatic amine 2,6-Xylidine (2,6-dimethylaniline) is used as a chemical intermediate in the production of dyes, pesticides, and pharmaceuticals (IARC, 1993). It has also been detected in tobacco and tobacco smoke (Irvine and Saxby, 1969; Patrinakos and Hoffman, 1979), a degradation product of aniline-based pesticides, and a metabolite of certain drugs, particularly the xylide group of local anesthetics. However, 2,6-dimethylaniline is toxic if inhaled, ingested, or absorbed through the skin and it is found to be carcinogenic (Kornreich and Montgomery, Jr., 1990; Oliveros et al., 1997; and Amat et al., 2004). These hazardous properties of 2,6-dimethylaniline necessitates the treatment of contaminated wastewater to prevent the deleterious effect of its to the environment. In order to degrade these kinds of toxic chemical, powerful oxidation methods are then required for an efficient treatment.

Advanced oxidation processes (AOPs) are potentially useful for treating aromatic compounds because they generate hydroxyl radicals (•OH), a powerful nonspecific oxidant. Hydrogen peroxide is one of the most versatile, dependable, and environmentally desirable oxidizing agents available. It is also commonly used as the source of OH radical in processes such as H_2O_2/UV (Beltrán et al., 1993) and Fenton's reagent (Plimmer et al., 1971; Arnold et al., 1995). The Fenton's reagent system has been used to treat both individual organic and inorganic substances under laboratory conditions and also real effluents from different sources like chemical manufacturers, refinery and fuel terminals, engine and metal cleaning works, etc. (Bigda, 1996). The process is based on the formation of reactive oxidizing species that are able to efficiently degrade the organic content of the wastewater stream (Chan and Chu, 2003). The drawback of Fenton's reagent is the production of a substantial amount of $Fe(OH)_3$ precipitate. To solve this problem, the application of iron oxides as catalysts in oxidizing organic compounds has been extensively studied. Goethite, hematite, semicrystalline and ferrihydrite have been used as and Wang, 1998). In previous work, a novel supported iron oxyhydroxide (FeOOH) granular catalyst to oxidize benzoic acid by H_2O_2 in a batch reactor and in a continuous circulating fluidized-bed reactor (fluidized-bed reactor) was developed. The supported FeOOH was prepared by fluidized-bed crystallization (Chou and Huang, 1999; Chou and Huang, 1999b; Chou et al., 2001) and the process has been applied in the full-scale reactor (Chou et al., 2001, Chou et al., 2004).

Many studies have been carried out using fluidized-bed Fenton process to treat aniline, an aromatic hydrocarbon with one amine as its alkyl group. However, treatment studies have not included 2,6-dimethylaniline, an aromatic hydrocarbon with one amine and two methyl group. Therefore, it is interesting to determine whether 2,6-dimethylaniline can also be effectively oxidized by fluidized-bed Fenton process.

1.2. Objectives

1. To compare the oxidation efficiency of 2,6-dimethylaniline by using different type of carriers in fluidized-bed Fenton Process
2. To determine effect of initial ferrous ion concentration, hydrogen peroxide dosage, and pH on the oxidation of 2,6-dimethylaniline by fluidized-bed Fenton Process
3. To compare oxidation efficiency of 2,6-dimethylaniline by Fenton and fluidized-bed Fenton Processes
4. To investigate on the oxidation kinetics of 2,6-dimethylaniline in fluidized-bed Fenton Process

1.3. Scope of the research

1. Using lab scale fluidized-bed reactor of 1.35 liter
2. Using synthetic 1 mM 2,6-dimethylaniline wastewater
3. Working at room temperature
4. Operating in a batch mode