CHAPTER I

INTRODUCTION

1.1 Rational

o-Toluidine is an important aromatic amine that used in the dyestuffs industry and more recently in the rubber industry. Following short-term exposure, o-toluidine could induce methaemoglobinaemia. After long-term or repeated exposure, o-toluidine is considered possibly carcinogenic to humans. It has been demonstrated to be a carcinogen in mice and rats and has been classified as a human carcinogen. As a result, o-toluidine can be found in several wastewaters and is associated with an increased incidence of bladder cancer.

In recent years, there are many application techniques have been used for wastewater and industrial wastewater treatment such as UV/O_3, UV/H_2O_2, ozonation, Fenton's reagent (the mixture of H_2O_2 and ferrous ion), Fenton-like reagent (the mixture of H_2O_2 and metal ion), etc. These are so called advance oxidation processes (AOPs) which is based on the generation of a powerful oxidant, hydroxyl radical (·OH), that can react with most organic pollutants and lead to their mineralization. However, the iron sludge produced from Fenton process is the major disadvantage of this technique, but can be solved by electro-Fenton (EF) method. Moreover, the use of UV-light to enhanced EF process which called photoelectron-Fenton (PEF) method has been developed in order to increase the efficiency for mineralization of refractory organic pollutants.

This research study intended to investigate the optimization of reaction condition for the degradation and detoxification of o-toluidine (OT) by electro-Fenton process using a 2-levels factorial function to find the significant parameter and Box-Behnken response surface function in the Design-Expert software to determine the optimum condition. The degradation and detoxification of OT under the optimum condition were investigated by several Fenton processes, i.e. conventional Fenton, electro Fenton and photoelectro-Fenton processes.

1.2 Objectives:

1. To optimize the appropriate condition of OT oxidation by using electro-Fenton process
2. To investigate the degradation and detoxification efficiency of OT by several Fenton processes
3. To determine the kinetic information of OT oxidation

1.3 Hypotheses:

1. The Design-Expert software can provide the optimizing condition from primary experimental data

2. The efficiency OT oxidation by Fenton, electro-Fenton and photoelectro-Fenton processes depends on initial pH, amount of H_2O_2 and Fe^{2+}, application of electric current and UV light.

1.4 Scopes of Study:

1. Using a lab scale reactor of 3.5 liters.
2. Using synthetic wastewater with OT
3. Working at room conditions.
4. For the electro-Fenton process, titanium net coated with RuO_2/IrO_2 (DSA) was used as the anode, and the stainless steel was used as the cathode.
5. UV lamps were used as the irradiation source in photoelectro-Fenton process.