CHAPTER I
INTRODUCTION

Chlorophenols are widely recognized as ones of the most serious types of pollutants in water and wastewaters. They have great ubiquity because of a great diversity in their origins. They are, for example, used as synthesis intermediates or as pesticides. Moreover, natural phenol formed by lignin degradation during conventional production of bleached pulp when treated with chlorine or hypochlorite can lead to several chlorinated phenols, chlorinated guaiacols, chlorinated catechols, and other chlorinated compounds (Villasenor *et al.*, 1998).

In order to remove these kinds of pollutants, different methods have been used, such as coagulation, chlorination and ozonation. Chlorination presents a particular problem since it often generates carcinogenic by-products. Using granular activated carbon adsorption or air stripping needs further treatment of the adsorbing media. Incineration of organic wastes is not always effective and can generate large quantities of toxic emissions, such as products of incomplete combustion as well as heavy metal oxides into the atmosphere (Robertson, 1996). An ideal waste treatment process should completely mineralize all toxic species present in the waste stream without leaving behind any hazardous residue (Chen and Ray, 1999).

Photocatlysis, one of the advanced oxidation processes (AOPs), involves the utilization of a non-toxic semiconductor catalyst such as titanium dioxide (TiO_2) in conjunction with light illumination. When semiconductors are illuminated with light with an appropriate wavelength, they generate powerful oxidants, which will convert most organic materials into carbon dioxide and water. This process has been very effective in destroying a wide range of organic materials typical of those generated by the industries mentioned above (Robertson, 1996).

It was reported that 4-chlorophenol (4-CP) was completely degraded in the presence of 0.5%Ag/sol-gel TiO_2 because a small amount of Ag on TiO_2 attributes to the acceleration of superoxide radical anion formation (Moonsiri, 2002). To improve the activity for 4-CP degradation, the present study was to investigate Au/sol-gel TiO_2 and the synergistic effect of Au and Ag on sol-gel TiO_2 in an aqueous

suspended 4-CP solution. Furthermore, possibility of using TiO_2 immobilized on glass plates rater than suspended in 4-CP aqueous solution was studied.