CHAPTER I
INTRODUCTION

1.1 Introduction

Environment quality is certainly a worldwide concern. Most people are exposed to air pollution problems especially those who live in large cities. Air pollution is regarded as air poisoning, and the cause of many illnesses. The sources of air pollutants are both natural sources and human-induced, or anthropogenic origin. Normally pollution from natural sources does not establish problems severe enough to endanger life. The major cause of air pollution from anthropogenic sources is combustion. The use of fossil fuels for transportation, industry, energy conversion, and solid-waste disposal all contribute to the contamination of the atmosphere. It is noted that transportation is the single largest source of air pollution. Carbon monoxide has the highest amount among the toxic by products of combustion.

Carbon monoxide is a product of the incomplete combustion of carbonaceous fuels. The greatest anthropogenic source of this pollutant is internal combustion engines used for transportation. Automobiles accounted in 1981 for 77% of total emissions. Power plants and other large furnaces usually operate to insure virtually complete combustion. The very nature of the internal combustion engine requires operation with an oxygen deficiency which causes substantial formation of carbon monoxide.

Colorless, odorless and tasteless carbon monoxide gas has an estimated atmospheric mean life of about 2½ months. Carbon monoxide is hazardous for human health. Its effects on humans range from slight headaches, loss of

balance and irregular heart beat, nausea, weakness, loss of memory, numbness of senses, and to ultimately death, depending on the concentration and the time of exposure. This gas is lethal to humans within a few minutes at concentrations exceeding 5,000 ppm. The toxicity is due solely to the interaction of CO with blood hemoglobin to prevent oxygen transport. When a mixture of air and CO is breathed, both are transferred through the lungs to the blood and adsorb onto hemoglobin. Carbon monoxide reacts with the hemoglobin (Hb) of blood to form carboxyhemoglobin (COHb), thus reducing the capability of the blood to carry oxygen. Since the affinity of hemoglobin for carbon monoxide is more than 200 times as great as its affinity for oxygen. Carbon monoxide can seriously impair the transport of O_2, even when present at low concentrations.

The absorption of CO by the body increases with CO concentration, exposure duration, and the activity being performed. Carbon monoxide concentrations are especially high in congested urban areas where traffic is heavy and slow-moving such as automobile traffic in Bangkok. A person trapped in traffic at such location for an hour would show a COHb blood level close to 2.3 percentage which would affect the central nervous system impairing a person's time-interval discrimination and bright discrimination.

There are two strategies to reduce air pollution : prevention and remediation. Prevention implies moving forward to the energy consumption levels of last century. Because there is a shift in energy demand, remediation becomes imperative. Remediation is the essence of air pollution control engineering. Engineers must effectively and economically remove pollutants. The efforts of engineer aimed at controlling the pollutant emission of motor vehicles concentrate on the reduction of pollutant products. The principal purpose is to improve the scientific basis for the advancement of heterogeneous

catalytic processes which eliminate or at least minimize possible hazardous materials.

Because of the highly hazardous nature of CO, numerous studies of catalytic oxidation have been directed toward development of catalysts for air pollution applications to reduce the carbon monoxide from smoking, gas-fueled space heaters, and for safety gas masks for mine industries. The catalysts for these purposes should be active at low temperature and be water tolerant. Thus low temperature CO oxidation catalysts are being developed to meet these requirements.

Low temperature catalytic oxidation of carbon monoxide has been studied by large number of researchers in several aspect because of its significance in environmental pollution control, orbiting CO_2 laser and CO detectors. Noble metals; notably platinum, palladium and rhodium, have been reported to be especially well suited for catalyzing oxidation reactions. However, their low availability and high cost have caused considerable activity to develop highly effective oxidation catalysts which are inexpensive and plentiful. Transition metals are relatively abundant and cheap compared to the precious VIII group metal. So this research focuses on gold and silver supported reducible metal oxide which are manganese and cobalt.

1.2 Research Objectives

Noble metals supported on reducible oxide supports are a new class of high activity low temperature catalysts. The goal of this project was to investigate the long term stability and regenerability of a number of these catalysts, specifically to prepare Ag-Mn, Ag-Mn-Co, Au-Co, Au-Mn and Au-Mn-Co catalysts and test their activity under different conditions. We also wanted to see that the catalysts could be regenerated under mild conditions. In order to understand the functioning of the catalysts, their physical and chemical properties were also analyzed.