CHAPTER I
INTRODUCTION

One of the basic needs in sustaining life is to have safe drinking water. Water is essential in many aspects, especially to be consumed as drinking water. Water can be easily contaminated which results in unacceptable qualities for consumption. It is widely known that water contaminated by bacteria is responsible for the spread of many diseases, especially epidemics in tropical areas.

One of the famous studies in 1849 indicated that individuals who drank water from a particular well on Broad Street in London were much more likely to become victims of a local cholera epidemic than those from the same neighborhood who drank from a different well (Masters, 1991). This paper showed a correlation between human waste, qualities of drinking water, and numbers of incidents of harming diseases. They did not find a likely source of the contamination which was sewage from the home of a cholera patient, but They were able to effectively end the epidemic by simply removing the handle of the pump on the Broad Street Well.

Water sterilization is to kill microbes which are present in the polluted water. This can be accomplished in several ways. One of them is to irradiate the water with ultraviolet light. The second popular method is chemical oxidation using an active form of oxidizing agents - ozone or hydrogen peroxide (Fass, 1992). Chlorination is widely used for disinfection in most cities throughout the world including Bangkok. The costs of these systems are very high. Moreover, such systems have high maintenance costs. They are

suitable only for commercial applications. Hence, it is very desirable and useful to develop a new method for drinking water sterilization by using a catalyst. Silver deposited on an inert surface exhibits a strong catalytic interaction with oxygen which results in strong bactericidal activity. The mechanisms of this bactericidal action can be divided into two steps. The first mechanism involves disruption of the electron transport system within the bacterial cell by silver ions which have been shown to have a binding affinity for the thiol groups of several amino acids. A second mechanism incorporates the well-known fact that silver binds irreversibly with protein to form a stable silver-protein complex. A third mechanism, which is the primary one of interest here, is the super oxygen ion (O2-), (an excellent oxidizer), generation by silver from dissolved oxygen in water.

The previous work on this subject in our laboratory used silver and chose a monolith as the support because the monolith provided a relatively high surface area and low pressure drop (Ketpukdeekul, 1996). It was found that increases in silver load and/or contact time resulted in increasing the E. coli destruction. However, there was a significant amount of silver loss to the water. This silver loss is not acceptable for drinking water. Therefore, it is imperative to develop an appropriate technique to prepare strongly-bound silver catalyst for disinfection applications.

This study chose alumina spheres and alumina powder as supports for silver deposition for drinking water sterilization. Silver as metal is believed to exhibit its oxidation power on killing bacteria contaminated in water.

This research is a continuation and expansion of the ongoing project of development of silver catalyst for water sterilization. The objective of this study was to investigate E. coli destruction efficiency of silver catalyst with different surface areas.