Chapter 1

INTRODUCTION

Currently, several industries in Thailand relates to volatile organic compounds (VOCs) that is a cause of air pollution problems. Aromatic vapors, such as benzene and toluene, and other organic solvents, such as acetone, are usually found in exhaust gas from surface coating factories, e.g. automobile assembly factories and furniture factories.

Because of toxicity, the presence of these vapors in atmosphere may cause fetal to health of people in that area. In addition, it may cause public nuisance [1, 2]. It is suggested that the amounts of the emission of hazardous toxic vapors must be regulated before being released to the atmosphere.

Many purification processes, e.g. absorption, adsorption, membrane separation or oxidation with ultraviolet, can be used to remove these organic vapors. In comparison with other processes, adsorption has been chosen frequently, since plenty of adsorbents are available commercially. In addition, it is possible to select from various local natural or modified adsorbents, e.g. activated carbon or carbon based adsorbents and volcanic rocks.

Some types of volcanic rocks, such as pumice, provide moderate fraction of pore volume naturally. While some other types of the volcanic rocks, such as perlite, are composed of a large fraction of pore volume after thermal treatment. Several types of volcanic rocks have been found in Thailand, such as at Lamnarai volcanic rock Groups at amphor Chaibadan Lopburi province. It is of interest to investigate adsorption performance of a naturally porous volcanic rock and an expanded volcanic rocks. The investigation emphasizes removals of volatile organic solvent from gas phase.

Adsorption of some aromatic compounds have been studied on various types of adsorbents. Adsorption of toluene and naphthalene vapors, for instance, were studied on silica gel under supercritical and subcritical condition [3]. Both adsorption equilibrium constant and adsorption rate constant were determined by the method of moment.

Adsorption of four normal alkanes (propane, butane, pentane, and hexane) on alumina in the temperature range 50-200 °C [4]. Various models and theories of chromatographic processes have been proposed to explain the behaviour of a small pulse of adsorbable species as it flows through a column or bed of particles. An explicit relation for the first moment of the eluted peak is obtained which still allows interpretation of chromatographic data so as to yield the equilibrium constant for adsorption.

The method of moment for determining adsorption equilibrium constants,

rate constants is described and applied for the adsorption of ethane, propane, and n-butane on silica gel at 50°C and atmospheric pressure [5]. The method rests upon recently developed theory for relating the moments of the effluent peak from column.

The purpose of this research is to investigate the possibility of adsorption aromatic vapor on selected volcanic rocks, found in Lopburi province. The adsorption investigation is composed of

- Effects of type of volcanic rocks (perlite, pumice)adsorbents
- Effect of type of adsorbate (toluene, acetone)
- Effect of size of adsorbent (40-60 mesh, 60-80 mesh, 80-100 mesh)