CHAPTER I

INTRODUCTION

1.1 Background

Separation and purification of gas or liquid mixtures by adsorption has become a major unit operation in the Chemical, Petrochemical and Pharmaceutical industries. Adsorbents are also required in many different applications, in either liquid or gas phase processes, such as air purification, gas separation and purification, wastewater treatment, organic solvent recovery, heterogeneous catalysis, decolorization of organic substances, etc. Activated carbons are widely used as adsorbents in various technologies due to their highly porous texture and large adsorption capacity.

In the present, Thailand has imported a large among of Anthracite from Vietnam and Loas. It has been widely consumed by many different industrials such as: Steel Manufacturing group, Battery Covers Manufacturer, Water Filtration Industry, Glass Manufacturer, etc. Extracted Anthracite from the mines usually comes in different shapes and sizes. Hence, when imported it must go through various processes include separating, transforming, polishing and grinding of minerals. Transportation and all above processes cause a large amount of very small anthracite powder, which is not only useless but also sense pollution. Thus it is attractive to turn the anthracite powder into useful.

Hydrothermal treatment of coal has been widely used as coal cleaning method and low rank coal upgrading. In coal cleaning method, it was used to remove SO_x and mineral matter from low rank coal. This method consists of the hydrothermal treating of coal with lime followed by acid washing. In case of low rank coal upgrading, it was used for removing water, active volatile matter and prohibiting readsorption of water from coal. By this treatment, handling problems and spontaneous combustion problems can be eliminated.

Supercritical water treatment is one of hydrothermal treatment, above water's critical conditions. It has been found to be a newly efficient method for regenerating exhausted activated carbon. Besides, it has been reported that this treatment tend to slightly increase in adsorption capacity of regenerated activated carbon compare with original one, due to the opening of closed pores.

According to reasons described above, hydrothermal treatment or supercritical water treatment may be good pre-treatment methods for preparing activated carbon from waste anthracite powder.

1.2 Objectives

1.2.1 To prepare and characterize activated carbon from waste anthracite powder.

1.2.1 To investigate the effect of hydrothermal pretreatment on properties of activated carbon.

1.3 Scope of Study

1.3.1 Raw material of this investigation is limited anthracite powder size 0.60 – 0.710 mm.

1.3.2 Prepare activated carbon from anthracite powder by physical process.

- Carbonization under N_2 atmosphere will be carried out in the range 500 – 700 °C.
- Activation with steam will be carried out in the range 750 – 950 °C.

1.3.3 Prepare activated carbon from anthracite powder by physical process with hydrothermal pretreatment.

- Maximum pressure and temperature of hydrothermal treatment process are approximately 1305 psi and 300 °C, respectively.

1.3.4 Effect of the addition of sodium and potassium solution during hydrothermal treatment will be investigated (no addition or addition).

1.3.5 Characterization of some selected anthracite powder, char and activated carbon are:

- Surface area, pore volume and pore size distribution of selected samples.

1.4 Expected Benefits

1.4.1 Problems in the management of useless anthracite powder will be reduced.

1.4.2 Activated carbon from useless anthracite powder will be obtained.

1.4.3 Understanding the effect of hydrothermal treatment on porous properties of activated carbon.