



CHAPTER I

INTRODUCTION

Petroleum, which is used as feedstock for refinery and petrochemical process contains hydrocarbon as main composition and contains some impurities such as sulfur compounds, nitrogen compounds, oxygen compounds and metal compounds. These impurities may cause serious problem in refinery or petrochemical process, for example some metal compounds cause deactivation of catalysts in catalytic processing. Thus removal of these impurities is necessary for improving petroleum before further processing.

Arsenic and mercury are the metal compounds that usually found in wide range of petroleum such as natural gas, crude oil and shale oil. The concentration of arsenic and mercury are found in various ranges, depending on the source of petroleum (Details are shown in chapter II). The structure of arsenic in petroleum is found in ionic and organometallic compounds while mercury is found in elemental, ionic and organometallic compounds.

The presence of arsenic and mercury in petroleum can be the cause of serious problem. For example, arsenic and mercury in the feedstock of catalytic reaction such as catalytic hydrogenation and catalytic reforming cause catalysts deactivation. In addition, mercury can also be a major source of problem in liquefied natural gas plants. Mercury corrodes the aluminum heat exchanger cause the plants to shutdowns. Arsenic can deposit on high-temperature naphtha cracker tube surface to cause coke build-up, reduced production and reduced product selectivity. Furthermore, arsenic and mercury can be the cause of environment problems since burning fuel with high-containing arsenic and mercury results in unacceptable pollution. From above reason, it is necessary to

remove or reduce the amount of arsenic and mercury in petroleum for solving the petroleum processing problem and meeting the environmental limitation.

Several methods have been proposed for removal of arsenic and mercury from petroleum. It can be classified into two groups, chemical treatment and adsorption. Chemical treatment is the method that using heat (only for arsenic) or chemicals to convert arsenic and mercury to the form which easy to remove. Another method, adsorption, is the most widely used for removal of arsenic and mercury. This method comprises of contacting petroleum with an adsorbent under suitable condition. The adsorption method provides a high efficiency of arsenic and mercury removal.

From the literature reviews, nickel and copper adsorbent has been frequently used for removal of both arsenic and mercury in petroleum. However, there is no indication about forms of arsenic and mercury which can be adsorbed on nickel and copper adsorbent. Since these adsorbents were prepared by different technique, its properties are also different. It is very difficult to compare the efficiency of these adsorbents. Good results should be obtained by the same method. From the above reasons, this research concerns with the activity of adsorbents for arsenic and mercury removal and compares the efficiency of arsenic and mercury removal at different forms by adsorption method.

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