CHAPTER I
INTRODUCTION

One of the most commonly found problems in petroleum processes is mercury contamination. Mercury is present in petroleum in metallic form and/or in organometallic compounds. The concentration of mercury in crude oil and natural gas is highly dependent on geological location and varies between approximately 0.01 ppb and 10 ppmw (Wilhelm, 2001).

Although mercury is found in trace quantity, it causes problems to petroleum processing systems. In gas processing, mercury damages equipment and fouls cryogenic heat exchangers. In chemical manufacturing and refining, mercury poisons catalysts and contaminates waste water. In addition, mercury causes increased risk to the health and safety of workers. Therefore, mercury in plant feeds often requires process modifications to avoid the negative consequences and to comply with product specifications.

Various techniques have been developed to remove mercury depending on the existing forms and phase systems (Wilhelm, 2001). In gas-phase system, adsorbents consist of sulfur impregnated carbon, regenerative molecular sieve (Ag on zeolite) and metal sulfide on carbon or alumina. The most widely used system is sulfur impregnated carbon sorbent. In liquid-phase system, adsorbents consist of iodide impregnated carbon, a mol-siv amalgam system and a two-step process consisting of a hydrogenation conversion catalyst followed by a reaction of metallic mercury (Hg°) with a metal sulfide adsorbent to form mercuric sulfide (HgS). Then, mercuric sulfide is nonvolatile, insoluble and is retained on the bed.

The main scope of this research is to investigate the adsorption kinetics of metallic mercury (Hg°) from heavy naphtha on various adsorbents such as alumina (Al_2O_3), activated carbon, Beta zeolite and CuS impregnated adsorbents in batch system at temperature 50°C under atmospheric pressure. The BET, Freundlich and Langmuir isotherm would be used to fit adsorption isotherm data. The isotherm parameters were used to design the mercury removal system and, finally, the continuous system would be performed to predict the breakthrough time.