CHAPTER 1

INTRODUCTION

Mechanical octanes are required to prevent detonation or knocking during the combustion process in an automobile engine. Sustained heavy knock should be avoided because of possible damage to engine components, such as pistons and connecting rods, and because of unnecessary waste of energy through excessive heat rejection and loss of power.

Whereas it has been common for many years to improve the anti-knock rating of gasoline by adding lead alkyls and organic halogen compounds, this is now recognized to result in exhaust gases that endanger health. Due to worldwide lead phase out in gasoline, many attempts have been made to find other compounds which can replace lead as efficient octane improvers. Such compounds as MMT (methylcyclopentadienyl manganese tricarbonyl) (1-5) and iron pentacarbonyl (5,6) were used in Europe and the United Stated, but they were banned later for the reason that MMT aggraved the emission and air pollution, iron pentacarbonyl reduced lifetime of valve and other parts of the engine because of its combustion product, iron oxide.

Materials that received significant attention are oxygenates such as alcohols and ethers because they conserve crude oil, supply antiknock quality, and offer potential for reducing pollution. Oxygenates, which are important as gasoline blending components,

include methanol, ethanol, isopropyl alcohol (IPA), tert-butyl alcohol (TBA), and methyl-tert-butyl ether (MTBE) (1,4-10).

MeOH is the most attractive oxygenate from a strictly economic point of view. But the most serious problem, when its water content exceeds a critical level, is the separation of blends into hydrocarbon and methanol phases (7). This problem is exacerbated at low ambient temperatures. The use of higher molecular weight alcohols such as TBA, IBA, or IPA which can be practically blended with MeOH, decreases the water solubility of gasoline containing MeOH and increase the equilibrium concentration of MeOH in gasoline phase.

Nowadays, MTBE is widely used as avery effective octane improver. However, it must be blended in high proportion with gasoline (10-20% by volume) to meet the octane requirement. Furthermore, it is more expensive, comparing with the other oxygenates.

Another class of compounds is suitable non-toxic organometallic compounds, which might be used in place of lead as octane dope in gasoline. These are organotin compounds which selected for detailed investigation. Tin is in the same group as lead in the periodic table, it should have similar chemical properties. Tetraethyltin (TET) (3), tetrabutyltin (TBT), and tetraoctyltin (TOT) (5) were used in selected base oil and showed that the antiknock property was improved. In addition, organotin compounds can solve the pollution problem for its combustion products, inorganic tin compounds, are non-toxic and very inert (5). Furthermore, tin metal is an excellent lubricant when allowed to come into contact with moving parts of the engine, thus providing

the necessary lubrication and compensated for the loss of lubricating qualities of lead (5,11).

The mixtures of tetrahexyltin and alcohols such as IPA, IBA were used in selected base oil, boosting octane 2-5 units (12). In this study, MTBE and organotins such as tetrahexyltin are used to blend with selected base oil for detailed investigation. MTBE proportion should be reduced when used in low concentration of organotins to meet the same octane required.