CHAPTER I

INTRODUCTION

Petroleum and gasoline consist of blends of over 250 diverse hydrocarbons. Many of these are toxic and carcinogenic. Hydrocarbon escapes into the air during refilling, from the gasoline tank and carburetor during normal operation, and from engine exhaust. Transportation sources account for 30 to 50 percent of all hydrocarbon emissions into the atmosphere.

Carbon dioxide, a normal product of burning fuel, is non-toxic, but contributes to the greenhouse effect (global warming). All petroleum (hydrocarbon) fuels cause increased atmospheric carbon dioxide levels because they represent the combustion of fossilized carbon. By contrast, using renewable fuels, such as ethanol, does not increase atmospheric carbon dioxide levels. The CO_2 released when ethanol is processed and burned in vehicles is recaptured during plant growth. Argonne National Laboratory has concluded that ethanol results in 35 to 46 percent reductions in green house gas emission compared with conventional gasoline [1]. By helping restore the natural balance of CO_2 in the atmosphere, renewable fuels are an important part of global change mitigation.

Ethanol can be synthesized from almost all carbon sources such as natural gas, and bio-mass, which are more abundant resources than crude oil, less toxic than methanol and gasoline, and it is expected to be an alternative energy carried as a fuel in the near future. One of the disadvantages of using ethanol as a fuel is that it has lower heat combustion than gasoline; therefore, a large volume of ethanol than gasoline is required for an automobile to travel the same distance. One way of improving this situation is to increase the enthalpy (heat content) of fuel by chemical conversion in the automobile. This is accomplished by catalytic converting the ethanol into methane, carbon monoxide and hydrogen .The decomposition products have a higher energy than ethanol. The ethanol decomposition reaction is endothermic; hence, the reaction can be utilized for recovery of the waste heat from automobile and increases the heating value of ethanol. It is also applicable to an ethanol-fueled automobile in which the heat of the exhaust gas can be recovered with the reaction and the decomposition gas is fed to the engine.

Generally, catalysts comprising of metal group VIIIB is used for ethanol decomposition. Among these metals, palladium based catalyst has been reported as the highest yield of methane per gram of metal. To increase the metal surface area, palladium was deposited on solid support. Silica was considered to be the best candidate for a solid support because it is thermally stable, porous, and inert. However, it contains acidic sites which promote the dehydration reaction. In order to reduce the support acidity, the support was coated with a basic material. Lanthanum oxide (La_2O_3 or lanthana) has been reported as a good candidate. It was reported that lanthana increases the activity of silica towards the oxidation and hydrogenation of carbon monoxide. However, there has been no report about using metal deposited on lanthana-modified supported in ethanol decomposition reaction. Hence, to investigate the effect of lanthana on catalytic activity of lanthana-modified Pd/SiO_2 for ethanol decomposition is the aim of the study.

Objective of the study

To study the effect of lanthana on catalytic activity of lanthana-modified Pd/SiO_2 for ethanol decomposition.