CHAPTER I
INTRODUCTION

Gold (Au) has long been regarded as being the least useful of the noble metals for catalytic purposes. Recently the biggest surprise in activity has been revealed by group of Haruta. Their work showed that the suitable prepared gold supported on transition metal oxides was very active for the low temperature oxidaiton of CO. In addition, gold-based catalysts were capable for the selective oxidation of hydrocarbons, comprising alkanes, alkenes and aromatics which was an important chemical technology for the conversion of oil-and natural gas-based feedstocks to value added products such as oxygenates. They were used as key intermediates for polymer and organic synthesis.

For many research works, it has been proven that the catalytic reactivity of Au-based systems is dramatically tunable by control of the particle size and by careful selection of the support metal oxide. Generally, it is observed that Au supported on reducible oxides like TiO_2, has a higher reactivity compared to Au on irreducible oxides and the combination of Au and TiO_2 generates surprisingly high catalytic activity on oxidation. They are uniquely selective for the partial oxidation of propylene to propylene oxide (>99%) which is the second most common olefin feedstock in the petrochemical industry (after ethylene). In addition, Au-based catalyst is used in catalytic combustion which has been intensively found for variety of applications, such as the control or removals of CO, NO volatile organic compounds (VOCs), automobile exhaust emission control, and controls of by-products from chemical's production. However, the great interest of Au-based catalysts which are a new one in catalysis field is to apply Au catalysts in oxidation reaction of ethylene. It is one of the most important processes in the petrochemical industry to produce the chemical intermediate like ethylene oxide. Additionally, the titania nanotubes as a support of Au-based catalysts which were very interested because of their exceptional electronic and mechanical properties as well as the very high specific surface area and thermal stability are also considered in this reaction.

The main purposes of this research work were to study reactivity of Au catalysts in oxidaton reaction of ethylene and to characterize Au catalysts which

were prepared by incipient wetness impregnation method on commercial grade of titania (TiO_2, Degussa P25) and synthesized titania nanotubes (TNT) obtained from hydrothermal treatment at temperature 423 K. In addition, calcination temperature, reaction temperature and amount of oxygen in reaction were investigated on the catalytic activity in fixed bed reactor.