CHAPTER I
INTRODUCTION

Gold has long been recognized as a less active catalyst. However, it has recently been found that when gold is highly dispersed on reducible metal oxides such as α-Fe_2O_3, it can surprisingly exhibit high activity for carbon monoxide oxidation at low temperature (Haruta *et al.*, 1993).

In the oxidative reaction, both the shape and size of gold particles, and the supports have shown an important role in the genesis of catalytic activity (Haruta, 1997). It has been demonstrated that the activity for carbon monoxide oxidation increases with decreasing size of the gold particles, whereas the size of the gold particles may depend on the material used as supports. High catalytic activity is usually obtained when gold is dispersed as ultra fine particles on selected alkaline earth or transition metal oxide supports such as TiO_2, α-Fe_2O_3, Co_3O_4, MnO_x, and ZrO_2 (Okumura *et al.*, 1998). Co-precipitation, deposition-precipitation (DP), and chemical vapor deposition (CVD) are the catalyst preparation methods that can provide highly dispersed gold catalysts, usually with the average diameter of gold particles equal to ~2 nm (Okumura *et al.*, 1998).

Yttrium oxide was found very active for oxygen activation (Hutchings and Taylor, 1999) and was excellent in hydrothermal stability (Fokema and Ying, 1998). In this study, yttrium oxide was chosen to be the new support for gold catalyst. Carbon monoxide and methanol oxidations were generally used for the catalytic activity testing. In addition, the effect of phase transfer of yttrium oxide towards the catalytic activity was also studied.

Au/Y_2O_3 and Au/NiO were prepared by co-precipitation method. The effects of gold loading and calcination temperatures on these catalysts were studied to find the appropriate conditions of the catalytic activity for carbon monoxide and methanol oxidation. Furthermore, the study of phase transfer of yttrium oxide with gold catalyst was also carried out.