CHAPTER V
CONCLUSIONS

The oxidation of CO over promoted metal oxide catalysts is an area of catalysis, which has been the center of discussion for many years. High-throughput screening of metal loaded $Ce_{0.75}Zr_{0.25}O_x$ mixed oxide by IR-reactor system provided the average different temperature rise of all catalyst formulations, indicating their activity in CO oxidation. Totally, fifty-four catalyst formulations were primarily screened by IR thermometer. On a ceramic screening plate containing 18 different catalysts the tests were conducted at a same batch. The activities were exhibited in term of average different temperature (ΔT_{avg}) or temperature rised upon the reaction. From the experiments, most of Ni/La-loaded and La/Li-loaded $Ce_{0.75}Zr_{0.25}O_x$ catalyst depicted high ΔT_{avg}, as compared to other formulations. For the Fe/Ni supported catalysts, only the one with Fe/Ni ratio of 1:9 gave high ΔT_{avg}. High-throughput method minimized the number of experiments necessary to obtain the information about catalyst samples. Moreover, this technique is suitably performed for expensively noble-metal loaded catalyst testing because only a small amount of each catalyst is needed for each screening.

After applied two criteria for selecting the lead formulations, the accurate activity of each formulation was further investigated. The Fe/Ni-loaded catalyst with the Fe/Ni ratio of 9:1 resulted in 80% conversion. Almost all of the Ni/La loaded catalysts, and 5% Ni-loaded catalyst had 100% conversion at 350°C. Further study showed that the Ni/La-loaded catalyst with the Ni/La ratio of 9:1 had five times conversion when compared to 5%Ni-loaded catalyst at lower temperatures. Because of La and Ni co-loading, the reducibility of support was greatly enhanced when compared to Ni single-loaded catalyst. The addition of La and Ni increased the efficiency of the reduction process of ceria in the support at low temperatures. Consequently, high oxygen mobility and better oxidation process were achieved in the presence of Ni and La co-loading.