CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

Zirconia was prepared by the sol–gel method using sodium tris(glycozirconate) as a precursor by varying the pH condition, the molar water to precursor ratio, and calcination temperature during the sol-gel process. Gel time, which can be controlled by varying the acid and base content or pH condition in the synthesis, was a crucial parameter affecting the physical characteristics of the zirconia oxide. The gelation time influenced the formation of gel network, and then the morphology and crystallite structure of zirconia. Additionally, the variation of the R_H had no influence on the physical properties of the zirconia catalysts.

By optimizing the water and pH conditions, zirconia with the highest surface area of ca.125 m^2/g was formed at the pH 11-12 and the molar of water to precursor ratio of 587 after calcination at 600°C for 4.5 hours. All catalyst synthesized in this study had the isotherm of Type IV with unimodal pore size distribution examined from BET surface area measurement. From XRD results, zirconia obtained was amorphous after the heat treatment at 400°C and below. The amorphous zirconia was crystallized into the tetragonal phase after heat treatment at 500°C. X-ray diffraction data showed that heating to higher temperatures caused the zirconia to transform into the monoclinic phase after calcination at 700°C. From the TPD experiments, zirconia with the largest acidity and basicity was achieved at pH 11-12 with the R_H of 587. Acidity and basicity of ZrO_2 was discovered to be proportional to its surface area and pore volume.

It is recommended that the zirconia be employed and tested as acid-base catalysts for various reactions, including hydrogenation of olefins and carbon monoxide, esterification, ester exchange, and amination. Furthermore, the study of activity on these reactions should be investigated to evaluate the quality of the catalyst. In addition, some promoters such as yttrium, calcium oxide and magnesium oxide, could be used because it has been reported that they can improve thermal stability of zirconia.