CHAPTER V

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

The perovskite compounds were prepared by the modified citrate method. Two types of perovskite compounds were prepared: the substrate perovskite compounds and the catalytic perovskite compounds. The substrate perovskite compounds were $La_{0.8}Sr_{0.2}Co_{0.6}Fe_{0.4}O_{3-\delta}$, $La_{0.6}Sr_{0.4}Ga_{0.3}Fe_{0.7}O_{3-\delta}$, and $Ba_{0.5}Sr_{0.5}Co_{0.8}Fe_{0.2}O_{3-\delta}$ or abbreviated as LSCF8264, LSGF6437, and BSCF5582. The substrate membranes exhibited the single-phase perovskite structure and relative density higher than 90 % after sintering at 1300 °C for LSCF8264 and LSGF6437 and 1100 °C for BSCF5582. The catalytic perovskite compounds were using $La_{1-x}Sr_xCoO_{3-\delta}$, $La_{1-x}Sr_xFeO_{3-\delta}$, $Ba_{1-x}Sr_xCoO_{3-\delta}$, and $Ba_{1-x}Sr_xFeO_{3-\delta}$ or abbreviated as LSC, LSF, BSC, and BSF, respectively, where x=0.2-0.6. La or Ba in A-site of ABO_3 based perovskite, which substituted with Sr showed the microporous structure. The lattice parameter estimated from the XRD analysis was calculated to investigate the influence of A-site cation on the lattice parameter as shown in the table 4.7-4.10.

The surface modification of substrate perovskite membranes with a porous layer by coating with the catalytic perovskite compounds were performed to increase oxygen permeability of the membranes. Amount of strontium (x) affecting the crystalline structure of the perovskite compounds were studied. The calcination temperature at 800-1100 °C is appropriate for single-phase transformed. The powder mixtures were mixed into a paste with an organic solvent, binders, a plasticizer, and dispersant. The catalytic perovskite layer was coated on both surfaces of the sintered membrane by a screen-printing method and repeated two times. Post heat treatment was conducted to control the porosity of the coating layer at 800-1,000 °C for 5 hours. The existence of the single-phase perovskite structure has been confirmed from the X-ray powder diffraction. The XRD analysis showed the single-phase of LSC64, LSC55, LSC46, LSF82, LSF73, BSC64, BSC55, BSC46, BSF82, BSF73, BSF64, and BSF55. The morphology of the coated membranes were investigated by scanning electron microscopy. The results indicated that the sintered temperature at 1,000 °C, the porous layer was formed.

The oxygen desorption of the perovskite compounds were determined by thermogravimetric analysis (TGA) and temperature program desorption of oxygen (O_2-TPD). Experimental results of TGA indicated that the amount of oxygen desorbed from the BSF55 catalyst is higher than that of the other catalytic compounds. By introducing a highly oxygen desorbed BSF55 coating on the BSCF5582 membrane, significant promotion in the oxygen permeation fluxes could be obtained.

The large enhancement of the surface should be observed when BSF55 with the highest oxygen desorption was coated on BSCF5582 substrate membrane. In the case of the combination of the LSGF6437 membrane and the BSF55 catalyst show moderate result while the LSCF826 membrane coating with BSF55 show the lowest result.

5.2 Suggestions

From all results, future work should be focused on the following:

1. To study oxygen permeation flux of BSCF5582 perovskite membrane coated with BSF55 by using the membrane reactor.
2. To test the electronic conductivity of the coated membrane by using impedance method.