Chapter 5

Conclusions

The objective of this research was to investigate the effect of cobalt (Co) and iron (Fe) substitution on the properties such as phase, crystal structure, electrical conductivity, thermal expansion coefficient and microstructure of Sr-doped $LaMnO_3$, which used as cathode material for SOFC.

The selected base composition in this work was $La_{0.84}Sr_{0.16}MnO_3$ (LSM). The preparation of this material was carried out by conventional mixing process, using oxides and carbonate as raw materials. The results could be summarized as follows:

Effect of Co dopant

1. Co-doped LSM exhibited monoclinic structure like undoped LSM and lattice parameter decreased as Co content increased due to the smaller size of Co ion as compared to that of Mn ion.

2. Undoped LSM provided the highest electrical conductivity at 1000°C of 165 S cm^{-1}. 20 mol% Co in LSM decreased the electrical conductivity because of the electron-hole charge compensation. However, the electrical conductivity shifted upward as Co content was up to 40 mol% since the number of electrons dominated.

3. The grain size of sintered specimens decreased as Co content increased.

4. The thermal expansion of LSM was 11.62 $x10^{-6}$ K^{-1} and it increased up to 13.63 $x10^{-6}$ K^{-1} as Co content was 40 mol%.

Effect of Fe dopant

1. 20 mol% Fe doped LSM exhibited monoclinic structure but 40 mol% Fe doped LSM exhibited orthorhombic.

2. The electrical conductivity decreased as Fe content increased because of the decrease in charge carrier for small polaron hopping and the high amount of second phases.

3. The grain size of sintered specimens increased as Fe content increased.

4. Substitution of Fe in LSM insignificantly affected on the thermal expansion coefficient.