

## Chapter 5

### Conclusions

The objective of this research was to investigate the effect of strontium (Sr) and magnesium (Mg) substitution on the properties such as phase, crystal structure, electrical conductivity, thermal expansion coefficient and microstructure of Sr- and Mg-doped  $\text{LaAlO}_3$ , which used as electrolyte material for SOFC.

All compositions were prepared by the conventional mixing process, using oxides and carbonate as raw materials. The results could be summarized as follow:

1. The single phase of undoped and the substitution of Sr was obtained by calcination of powder mixture at  $1350^\circ\text{C}$  for 4 hours. The second phases could be observed in Mg modified S10. Almost all compositions exhibited pseudocubic structure. The cell volume increased with increasing of Sr and Mg.
2. After sintering, there was the presence of the second phase in all compositions. This was possibly due to over limitation of the solid solution of composition and inappropriate sintering conditions.
3. The electrical conductivity of all compositions was temperature dependent in which it increased as the temperature increased. The results were obtained by both ac and dc methods. M15 showed the highest electrical conductivity of  $301.06 \times 10^{-3} \text{ S/cm}$  at  $1000^\circ\text{C}$  and  $37.23 \times 10^{-3} \text{ S/cm}$  at  $800^\circ\text{C}$  were obtained from ac method.
4. SEM analysis revealed that the undoped pellet had the largest grain size. The average grain size decreased when doped with Sr 5mol%. Also, the amount of the second phase increased with the amount of Sr dopant. The average grain size decreased as substituted Mg in S10.

5. The thermal expansion of M15 ( $11.93 \times 10^{-6} \text{ K}^{-1}$ ) was close to that of  $\text{La}_{0.9}\text{Sr}_{0.1}\text{MnO}_3$  ( $12 \times 10^{-6} \text{ K}^{-1}$ ). The thermal expansion coefficient increased as Sr and Mg content increased.