CHAPTER 8

CONCLUSIONS AND SUGGESTIONS FOR FUTURE WORK

The conductivity for samples containing 10 wt % and 20 wt % CuI is $4.68\times10^{-7}\,\mathrm{Scm}^{-1}$ and $7.24\times10^{-7}\,\mathrm{Scm}^{-1}$. It can be inferred that the major charge carriers contributing to conductivity are the Ag^{+} ions. This is strengthening by the M_i versus frequency plots that exhibit a peak for all temperatures in the temperature range studied. Peaks in such plots indicate that the materials are still ionic conductors.

CuI is known to be an electronic and hole conductor. It can be implied that incorporation of 30 wt % and more CuI make the sample a mixed conductor. This is assured from the absence of peaks in the M_i versus log frequency plots. Hence, it can be inferred that the increase in conductivity at room temperature is attributed to electrons and holes. The incorporation of more than 10 wt % CuI has reduced the grain boundary resistance and the sintering at 250 °C for 5 hours has helped to make the sample having a more continuous phase that enables more electrons and holes to be transported along with Ag^{+} ions which may now be the minority carriers. At 40 wt % CuI where the conductivity is 1.75×10^{-5} Scm^{-1}, the majority carriers are electrons and holes.

Incorporation of 10 wt % CuI seems to delay the conversion from γ- to β-AgI. Although the log σ versus 1000/T for 10 wt % CuI containing sample still show the hump that can be attributed to competition between β- and γ-AgI, this hump is not that observable for sample containing more than 10 wt % CuI. This justify the third objective of this study whereby the incorporation of CuI into the mixture and sintered at 250 °C for 5 hours has increased the metastability of γ-AgI since such competition between γ- and β-AgI is no longer observed in log σ versus 1000/T plots. This result is supported by XRD studies which confirmed the absence of β-AgI.

In short, the highest conducting sample is a mixed conductor and composition of 40 wt % CuI- 60 wt % AgI has the highest conductivity with good mechanical strength. The mechanism of conductivity is by quantum mechanical tunneling (QMT) since the index *s* as in $\sigma = A\omega^{s}$ is quite independent of temperature.

Further work can be carried out to improve the material that is by rising up the sintering temperature to the α-phase of CuI. It would be interesting to investigate the α-AgI and α-CuI contribution to conductivity. The sintering temperature can also be prolonged to make sure all the ions have adhered to each other.

Some future work can also consider another material to add into the binary system to enhance the conductivity of the whole system.