CHAPTER VII
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The β crystalline phase of PVDF films has been investigated by technique of Fourier TransForm Infrared Spectroscopy (FTIR). It can be calculated that F (β) value is high in DMF solution-crystallized PVDF and high draw ratio which corresponding to piezoelectric properties, However, SEM micrographs show defect of PVDF film fabricated from solution casting therefore compressed PVDF was selected. Increasing of β crystalline phase can be confirmed by XRD diffraction as the draw ratio increase. The piezoelectric properties are investigated resulting the increasing of dielectric constant with increasing drawn ratio. The ferroelectric properties are observed in high β crystalline PVDF films. It can be concluded that the ferroelectric properties are governed by β phase. The piezoelectric coefficient of undrawn and drawn PVDF under the same poling conditions increases with an increasing fraction of β crystalline phase. The stretching PVDF film has no effect with melting temperature but has effect with crystallinity of PVDF film.

The PVDF/ $Ba_{0.7}Sr_{0.3}TiO_3$ composite with 0-3 connectivity were successfully fabricated. The $Ba_{0.7}Sr_{0.3}TiO_3$ increase in the composite, the crystalline phase of ceramic increase and the intensity of PVDF peaks tends to be disappeared. The $Ba_{0.7}Sr_{0.3}TiO_3$ powders were derived from sol-gel process at different temperature dispersed in PVDF matrix; however, large of agglomeration were found in composites at high $Ba_{0.7}Sr_{0.3}TiO_3$ content (70%wt). It was found that increasing the amount of ceramic powders in composites and the temperature of calcine ceramic powders enhance the dielectric constant of composites. The application of composite depends on temperature because the dielectric constant of composite does not remain constant with temperature. Also the thermal stability of the composites can be improved by higher amount of ceramic powders but melting temperature of composite does not change compared to pristine PVDF.

The PVDF/ BT composite with 0-3 connectivity were successfully fabricated. The BT powders which come from calcining and sintering process was dispersed in PVDF matrix; however, large of agglomeration were found in composites

at high BT content (70%wt). It was found that increasing the amount of ceramic powders in composites enhances the dielectric constant of composites and sintered powder can enhance dielectric constant of composite also. The PVDF/sintered BT powder displays ferroelectric application more than PVDF/calcined BT powder because grain ceramic of sintered BT powder occurs.

6.2 Recommendations

1. The temperature dependent properties of stretched film should be investigated.
2. The stretched PVDF/ $Ba_{0.7}Sr_{0.3}TiO_3$ composite should be investigated for piezoelectric properties.
3. The sintered $Ba_{0.7}Sr_{0.3}TiO_3$ powder is added into PVDF matrix should be investigated for piezoelectric properties.