CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Bacterial cellulose (BC) was incorporated with poly(vinylidene fluoride) (PVDF) solution by using DMF as a solvent and dispersing medium which can help to obtain good dispersion and distribution of BC in PVDF solution. The BC/PVDF blends were casted for a few days and further follow by hot-pressing process. The TEM images suggested that BC 's structure was a fiber network with fiber diameter about 50 nm. In addition, results from XRD, FT-IR, DSC and TGA confirmed that our bacterial cellulose was successfully prepared. For BC/PVDF blends, it was found that there was a combination of mixed phase which can confirm by XRD and FT-IR. The amount of bacterial cellulose had no effect on the crystallinity until 10 wt% of BC was added, but there was a significant decrease of amount of crystallinity at 15wt%BC. This may be the fact that the BC network was formed and obstructed the PVDF chains not to pack closely. In addition, BC had no effect on the crystalline melting temperature, but increased of thermal stability which degradation temperature was increased about 40 °C. Incorporation of BC can enhance the storage modulus and dielectric constant at wide range of temperature, but lower the transparency which is the most important property. The BC2.5PVDF97.5 blend showed higher percentage of transmittance than any other BC/PVDF blends in all range of visible light.

BC2.5PVDF97.5 was chosen to study the effect of silver nanoparticles (AgNPs) filled. Although the presence of AgNPs reduced the β-crystalline phase, but due to it is conductive filler, the dielectric constant tended to increase as the amount of AgNPs increased. The highest dielectric constant (16) was obtained at temperature of 50 °C and frequency of 10 MHz with 0.5wt% of AgNPs in tertiary blends which is higher than neat PVDF for 4 times of magnitude. As amount of AgNPs increase, the

percentage of transmittance becomes worse, so this nanocomposite was still not suitable to be used in touchscreen application.

6.2 Recommendations

1. For piezoelectric constant investigation, d_{33} meter. In Thailand this instrument is rarely used and also normally used with piezoelectric ceramic which has high piezoelectric coefficient. The more suitable tool for observing piezoelectric behavior of polymer is thermal stimulated current measurements (TSC), but the machine is not available in Thailand.

2. Due to the surface plasmon effect in AgNPs which forming an agglomeration, then this phenomena can make the silver nanoparticles absorbed the energy at the wavelength in the range of visible light and emit the complimentary color. So the nanocomposite film had a green color. Another type of conductive filler should be studied.

3. Due to high boiling point of DMF and the solubility of DMF which was very close with PVDF, it was very hard to extract solvent out of the polymer solution causing the pale yellow color in the PVDF film resulting in the lower transparency, so another type of solvent should be considered. Anyway, other compounding method should be interesting.