CHAPTER XII

CONCLUSIONS AND RECOMMENDATIONS

12.1 Conclusions

Cellulose reinforced with polyurethane based resin as nanocomposite was successfully prepared by UV curing polymerization technique and it was further tested the relevant properties for being as an excellent substrate for organic light emitting diode. It was evident that this nanocomposite give light transmittance of >80%, coefficience of thermal expansion of <20 ppm/K and refractive index of 1.5. These are the minimum properties which required for OLED substrate. Furthermore, nanocomposite was continually polished by ferrofluid solution for surface smoothness proposes. The roughness of surface was reduced to be less than 5 nm and after that it was consequently deposited with Si-O layer by plasma enhance chemical vapor deposition in order to protect with water vapor transition rate (WVTR) from surrounding environment. The WVTR was reduced to level of 10^{-4} g/m^2/day. WVTR result need to be further improved as level of 10^{-6} g/m^2/day which required for OLED substrate. Cellulose nanocomposite deposited with Si-O layer still exhibited additional feature of flexibility.

After substrate preparation, OLED was consequently fabricated by both dry and wet technique. Dry technique generally offered high OLED quality comparable to wet technique. This technique commonly used high cost of fabrication. However, from the industrial point of view, the use of wet technique (desktop inkjet printer) is remarkably preferred in order to extend this substrate for marketing propose in printed electronic. Therefore, PEDOT: PSS solution and silver nanoparticle were successfully deposited as anode and cathode layer, respectively. While, ZnS nanoparticle, (Mn, Cu) - substituted ZnS and hybrid ZnS and PVP composite were prepared for emissive layer.

Up to the present time, OLED was successfully fabricated by desktop inkjet printer. However, the OLED lifetime is still low. This is because the water vapor in air can be absorbed and OLED layer was then destroyed.

Here, we wish to further develop the OLED quality fabricated by desktop inkjet printer technique. The ling-life OLED was expected to be achieved in the near future.

12.2 Recommendations

The recommendation of the future work will be based on the development of substrate with higher percent of cellulose. Due to the excellent properties of cellulose as mentioned on this thesis, more than 50 percent of cellulose will be required in order to use as an effective substrate for OLED. On the other hand, roughly 100 times behind WTVR requirement of flexible display substrate, cellulose composite may have to deposite with Si_3N_4 layer which was commonly well known as excellent barrier against both moisture and oxygen. Moreover, in order to obtain the excellence on photoluminescent spectra, nanoparticle of ZnS will be mandatory to prepare.