CHAPTER I
INTRODUCTION

The push toward to the development of bio-based material has been evident in the past decade. Achievement of this novel promising concept can easily offer numerous potential applications including infrastructure, smart packaging as well as flexible electronics. Among the flexible electronic device, organic light emitting diode (OLED) is a versatile platform system that has attracted worldwide attention. From the past, OLED was traditionally fabricated on glass. Although, the use of this glass as substrate provides the excellence in term of roughness and transparency, the flexibility limits its use. Some of research has proposed the use of transparent polymer in order to replace glass substrate. However, conventionally transparent polymer offer high coefficient of thermal expansion. This concern can consequently make electronic device lifetime too short. Up to the present time, in order to fulfill flexible characteristic and maintain the excellence on thermal expansion, we have successfully development transparent bacterial cellulose (BC) nanocomposite. From the fundamental point of view, the use of BC generally provides numerous advantages including lightweight, low coefficient of thermal expansion (CTE, as low as 0.1 ppm/K), high Young's modulus (114 GPa), high degree of crystallinity (89 %). The use of this composite can subsequently provide additional feature of flexibility. This composite has been further developed surface smoothness and reduced water absorption ability by the use of ferrofluid and deposition of Si-O film, respectively. That make cellulose composite ready for use as an excellent substrate.

In order to use this BC nanocomposite with more efficiency, it will be consequently developed as additional feature of touch screen. This novel gesture of cellulose composite can be further extended on sensors and actuators application. From the view point of electronic polymer, electro-active polymer was theoretically described the relationship between mechanical and electric properties. This concept can easily lead to use for touch screen if force was applied to polymer and it subsequently responded on electrical signal which called piezoelectric touch screen.

However, electroactive polymer has some drawback, its performance degrade quickly with time and low piezoelectric charge constant compare to common ceramic piezoelectric materials. To overcome these drawbacks, adding small amount of conductive filler such as graphene oxide, carbon black and multi-walled carbon nanotubes (MWCNT) were investigated. The MWCNT become a major conductive filler due to their unique electrical, thermal and mechanical properties and modifiable sidewalls. Besides, MWCNT in polymer matrix can enhance dipolar orientation of the composite led to high polarization along electric field.

The objective of this research work is to development bacterial cellulose nanocomposite as a flexible piezoelectric touch screen. Firstly, BC was blended with poly(vinylidene fluoride), PVDF, which is the strongest piezoelectric polymer. The blends of PVDF/BC are expected to exhibit interesting piezoelectric behavior. Then, the optimum composition of PVDF/BC blend was chosen to enhance their piezoelectric and dielectric properties by adding MWCNT at various contents. In addition, the morphological, thermal and mechanical properties of these blends were discussed based on basis properties for electronic applications.