# CHAPTER I

# INTRODUCTION

## 1.1 General Introduction

In the past decade, developing light emission properties of materials received much attention for display industrial. Polyimide (PI) was invented by DuPont Co. which was called Kapton polyimide in 1960s [*1*]. It shows several properties such as thermoxidative stability, high modulus, excellent electrical properties, and superior chemical resistance but it showed insufficient properties such as radiation durability against UV light, transparency, chemical and thermal stability properties which were important for optoelectronics and display technology[*1*]. While adding fluorine atom to PI, it improves several properties such as high electronegativity, high thermal and chemical stability, radiation durability against UV light, good transparency in the visible and NIR regions and lower the glass transition temperature of polyimide [*1*]. PIs were then prepared from 2,2-bis(3,4-dicarboxyphenyl) hexafluoropropane dianhydride (6FDA) which were reported by other researches [*2-4*]. The 6FDA PIs show good transparency and lower dielectric constants than those prepared from other nonfluorinated dianhydrides.[*1*] Therefore, fluorinated PIs, which can be used in optical light-emitting applications, exhibit high radiation durability in the UV ($\lambda$=200~380 nm) region, high transparency in the visible ($\lambda$=380~740 nm) and the near infrared (NIR) region ($\lambda$=740~2500 nm).

Nanocrystals of semiconductor materials have been extensively studied in the past decade for use in light emitting diodes [*5*] and photovoltaic solar cells [*6*]. Zinc oxide (ZnO) is a versatile material with many applications including antireflection coating, transparent electrodes in solar cells, gas sensors, varistors light emitting diodes and surface acoustic wave devices because ZnO is an n-type semiconductor, which has a band gap of 3.4 eV and an exciton binding energy of 60 meV. At room temperature, it emits ultraviolet (UV) luminescence, so much attention is now focused on light emission properties of ZnO [*7*].

Combining ZnO nanoparticles with polymer could enhance its optical properties such as fluorescence and radiation durability. ZnO/polymer composites have been produced with different polymer matrices, such as poly(vinylpyrrolidone) [*8*] and poly(hydroxyethyl methacrylate) [*9*]. Therefore ZnO dispersed homogeneously in PI films interests us due to expected unique optical characteristics such as high photoluminescence, high transparency, and high radiation durability which could be applied in optoelectronics, light emitting diodes, photonics and display industries in the future.

## 1.2 Objectives of the Present Study

To characterize the photoluminescence of zinc oxide (ZnO) nanoparticles dispersed polyimide films.

## 1.3 Scopes of the Present Study

1. Thermal curing in different atmosphere and temperature (300-350°C).
2. Concentration of zinc oxide nanoparticles.
3. Compare photoluminescence and thermal stability of dispersed ZnO nanoparticles in polyimide film.