CHAPTER V
CONCLUSIONS

A polyimide-clay (PI-clay) nanocomposite where montmirillonite is dispersed at the molecular level has been synthesized by using BPDA-PDA solution of poly(amic acid) and montmorillonite intercalated with an ammonium salt of dedecylamine. Both PI and PI-clay films are subsequently prepared by means of solution casting techniques. As seen from WAXD patterns of nanocomposite film, this hybrid has a special structure in which montmorillonite is dispersed homogeneously. These results suggested that polyimide-clay hybrid can be classified as exfoliated nanocomposite.

Due to this special structure, the polyimide-clay nanocomposite exhibits improvement in thermal property, gas permeability, electrical resistivity, and adhesion properties. The TGA results show a thermal stability improvement by as much as 40 °C relative to untreated polymer. In the case of gas permeability, only 3 wt% addition of clay brings permeability of O_2 gas to value less than half of that of ordinary unfilled polyimide. Furthermore, this hybrid shows improvement in electrical resistivity due to the prevention of electrical tree growth by clay particles. It is found that higher loading of clay contents raises the electrical resistivity of the films over the temperature range of 50-350 °C. As temperature increases the electrical resistivity of the film decreases remarkably and at the highest temperature, 350 °C, the electrical resistivity is in the order of 10^6 Ω.cm, which is still in the range of electrical resistivity for insulation class. More importantly, adhesion between the film and silicon substrate using γ-APS as an adhesive increases with increasing clay content.