

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

The 0-3 connectivity of void-polymer composites was successfully prepared from blowing agent compression molding and phase separation technique. The void size and porosity of voided films can be controlled by varying blowing agent concentrations and polymer concentrations, respectively. Optical microscope and Scanning Electron Microscope images confirmed the creation of spherical voids inside the structure of voided films. TGA and DSC thermograms show that the internal voids did not affect on the thermal behaviors of the polymer films. The dielectric constants of voided films were lower than those of dense films according to dielectric mixing rule. The introduction of voids into the films considerably reduced dielectric constant according to dielectric mixing rule. The density of the voided film is directly proportional to dielectric constant as shown in Figure 7.1

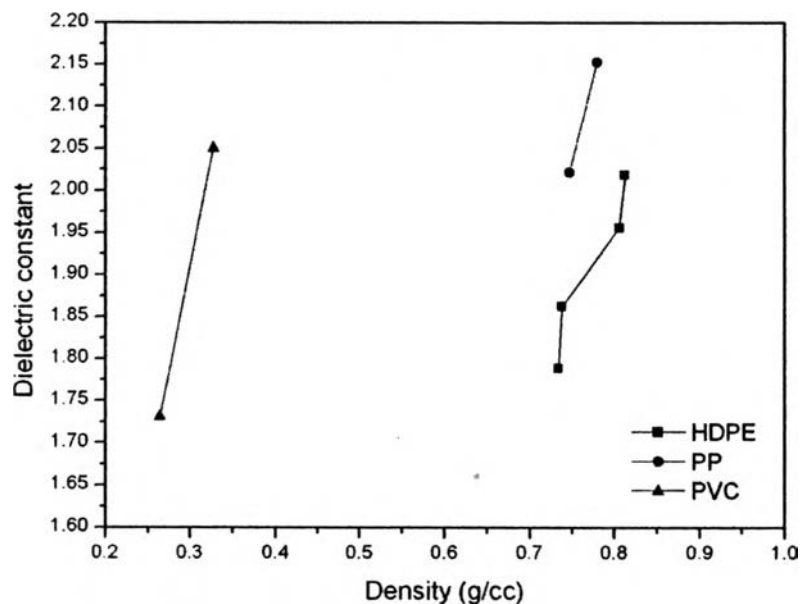


Figure 7.1 Correlation between the dielectric constant and density of voided films at room temperature and frequency of 1 MHz.

The apparent dielectric constants of HDPE and PP were fitted with the Serial model while those of PVC were fitted with the Rayleigh model, indicating a 0-3 connectivity of polymer/air composites. Dielectric properties of stretched voided

films showed higher results compared to unstretched films. This was related to charge displacement generated in the ellipsoidal shape and also, higher charge density than spherical voids. The internal voids can enhance the piezoelectric properties in HDPE and PP films but there was no effect on PVC film. The d_{33} values of ellipsoidal shape in voided HDPE and PP films increase up to 4 pC/N which higher than spherical shape. Higher piezoelectric coefficients with an increasing of crystallinity were obtained from stretched voided PVC film. The higher remanent polarization (P_r) and saturation polarization (P_s) of stretched voided films were obtained correspond with the apparent higher piezoelectricities.

Recommendations:

1. The piezoelectric coefficients should be higher if the simultaneous stretching and corona poling (SSCP) conditions was performed compared to the existing method which is stretched and corona poled (STCP).
2. The lower molecular weight of PVC powder should be used in order to prepare higher polymer concentrations. Therefore, the various porosities of voided films will be obtained.
3. The higher pressure during compression should be used because the smaller void sizes will be obtained.
4. The prepared voided films should be thinner in order to make the poling more efficiency.