CHAPTER IV

CONCLUSIONS

Polypropylene nanocomposites where montmorillonite is dispersed at the molecular level have been prepared. DRIFT spectra proved that the modified silicate clay can be successfully grafted with MAPP by the formation of the amide group. The delamination of the montmorillonite clay in the nanofiller was confirmed by the X-ray powder diffraction (XRD). The basal peak position indicated that the interlayer distance of montmorillonite is 22 °A. This result showed the expansion due to the interprenetration of the polymer into the basal spacing of the modified silicate clay. TEM micrograph revealed that the micron-sized clay tactoids have been expanded by the polymer into accordian - packets. We found that particles are finely dispersed, some individually, many are stacked in thin layers. The degree of crystallinity of the nanocomposite are independent of the amount of added filler.

Tensile properties showed a large increase in the Young's modulus due to the effect of filler and clay content. A significant change in the Young's modulus occurs when only a small amount of filler and clay is present. For the tensile strength, there is a slight increase in σ_y with a small amount of filler and clay content before reaching an asymptotic value. There are some maximum values of E and σ_y for the effect of silane concentration.

Flexural properties showed increases in the flexural modulus and flexural strength for the effect of increasing the filler and clay contents. The most noticeable change in the flexural strength is an increase (~50 %) of the ultimate strength due to the effect of filler and clay content. There are

some optimal values of silane concentration corresponding to the values of flexural modulus and strength.

For the impact resistance, we found a dramatic drop in the impact strength observed at high filler and clay content. For the effect of silane concentration on the impact property, we found that some optimal amount of silane should be used.

For the slow crack growth testing, we found that polypropylene nanocomposite showed a substantial increase in the time to initiate fracture for the nanocomposite containing only 10 wt.% filler content. This can be explained in term of tie molecules which are most effective when the filler is finely dispersed.

This study clearly demonstrates that the presence of the special structure of this type of filler, montmorillonite, greatly modifies the mechanical properties of iPP. These positive outcomes on both tensile and flexural strength are presumably caused by the reinforcement effect which increases with the anisotropy of the modified silicate clay.