CHAPTER V
CONCLUSIONS

In this study, admicellar polymerization of propylene can be conducted on $CaCO_3$ particles. The method was employed to form thin polypropylene films on the surface of $CaCO_3$. The $CaCO_3$ particle exhibited a PZC at 11.4 and anionic surfactant, SDS, was used with the solution pH adjusted to 8. The presence of a small amount of salt, sodium chloride, substantially improved the SDS adsorption on $CaCO_3$.

Evidence that a polypropylene coating had been formed on the $CaCO_3$ surface were (i) the propylene pressure drop that occurred during the adsolubilization and admicellar polymerization processes, (ii) weight loss measurements, and (iii) FT-IR results.

Non-isothermal crystallization studied revealed that incorporation of $CaCO_3$ particles shifted the crystallization peak towards a higher temperature. Two types of crystallization exotherm were observed: the single-peak type and the double-peak type. The double-peak type was only found for iPP sample filled with 30 wt.% untreated $CaCO_3$ particles, which was postulated to be a result of self-nucleation effect of residue iPP crystallites entrapped along the rough surface of untreated $CaCO_3$ particles. Surface treatment of $CaCO_3$ particles with stearic acid-coated and admicellar-treated reduced the nucleating ability of the particles. WAXD results suggested that the incorporation of $CaCO_3$ affected the apparent degree of crystallinity. Moreover, surface-treated $CaCO_3$ resulted in the reduction of degree of crystallinity of iPP matrix.

The effects of $CaCO_3$ with various types of surface treatment (untreated, stearic acid-coated, and admicellar-treated) on mechanical properties (tensile, flexural, and impact properties) of $CaCO_3$-filled iPP composites were investigated. Both stearic acid-coated and admicellar-treated $CaCO_3$ resulted in the reduction of both the tensile strength at yield, strain at yield, and the Young's modulus of the $CaCO_3$-filled iPP composites when compared with untreated $CaCO_3$. Similar results were shown for flexural strength. On the other hand, the impact strength of composites filled with stearic acid-coated and admicellar-treated $CaCO_3$ was higher

than untreated $CaCO_3$. SEM studies indicated better dispersion and decreased agglomeration of the filler upon surface treatment of $CaCO_3$. These results clearly demonstrated that surface treatment of $CaCO_3$ particles with stearic acid-coated and admicellar-treated mainly helped the dispersion of the particles within the iPP matrix.