CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

Porous clay heterostructures (PCH) were successfully synthesized by the surfactant-directed assembly of mesostructured silica within clay layers. Two types of clay (montmorillonite and bentonite) were used in this synthesis to obtain montmorillonite PCH (designated PMH) and bentonite PCH (designated PBH). In the last step of the synthesis, the surfactants (templates) are removed either by calcination or by solvent extraction. The surfactant residual of the calcined PCH is less than 3% while the extracted PCH is about 8-12%. The shapes of the N_2 adroption-desorption isotherms of calcined and extracted-PCH are very similar which belong to a type IV BET isotherm and show a type B hysteresis loop. Due to the increase in local heating, calcination can result in slightly structural collapses and give lower porosities. This is also evidenced by the larger hysteresis loop appearing in the adsorption-desorption isotherm. The calcined and extracted PCH have a BET surface area in the range 400-700 m^2/g and the corresponding pore volumes were in range 0.3-0.5 cm^3/g. The pore sizes which analyzed by BJH method were 1.7-3.9 nm. The framework pore sizes were in the supermicropore to small mesopore range.

From the XRD pattern, the five characteristic peaks of PP α-phase are observed in PP amd nanocomposites. The addition of PMH and PBH does not affect the crystal structure of PP matrix. The melting temperatures of nanocomposites are not different from the pure PP and the crystallization temperatures of nanocomposites are increased a little bit. It seems that the change in crystallization temperature is the effect of the added PP-g-MA. Thermal stability of nanocomposites tended to decrease because PCH can not act as a mass transport barrier. In addition, the dispersion of this type of clay particles in polymers is formed similar to the conventional composite, in which the clay particles are still formed tactoid or agglomerated, causing unimproved the thermal stability. The oxygen permeability of nanocomposites is higher than pure PP due to the porosity of PCH, which may induce more oxygen transmission passing through.

Recommendations

For suggested future work, PCH will be further functionalized and concentrated on trapping the more selective moleclues. The nanocomposites will blend with varying the clay content and study the mechanical properties. Finally, the nanocomposites will be introducing to the fabrication of the application products.