CHAPTER V

CONCLUSION

5.1 Organoclay

Bentonite is a source of clay mineral used in this study. The mine is located at central part of Thailand, Lopburi. Cristobalite was found as an impurity which cannot be removed by sedimentation technique.

Absorption of the alkylammonium ions into the clay layer was done by via cation exchanged reaction. The absorption process was found to be effect by clay's CEC value, loading concentration, functional group and size of alkylammonium ions.

The absorption of S18 involves 3 states. The first state is at a low S18 loading where a flat lying monolayer of S18 is formed. This state shows a high absorption efficiency, above 80%. The second state, transition state, involves an expansion of S18 coverage throughout the clay surface. The 3rd state, complete coverage, is a formation of the new phase which may be a flat lying bilayer or an interdigitate monolayer. The last state possesses has the lowest absorption efficiency.

In contrast to the S18 molecule, D18 shows two distinct absorption processes which are the initial absorption (or nucleation) and the growth. D18 is absorbed as the double layer with the island-like morphology onto the clay surface. The space between the island is reduced as the absorption is increased. The role of the supramolecular structure formation may play a role in absorption process. The detail investigation was not done in this study.

The absorption of T8 molecule is a two state processes. The initial state is where the T8 start to cover the clay surface. The second states is where the molecules are coming closer to a full coverage. This can be seen from the reduction in the absorption efficiency.

There are three steps of the packing orientation of organic ions in interlayer. First step, organic ions usually lay random parallel along to the interlayer. Second step, if the amount of organic ions is enough, the organic ions orientation transverse to

perpendicular with the interlayer plane. And the last step, the amount of organic ions is higher than CEC or area coverage much more the interlayer surface, the organic ions will be constructing to bilayer formation.

The washing process has an effect on the conformation of alkylammonium molecule in the interlayer. The absorption process has been shown that there are both chemisorb and physisorb. The physisorb molecule can be washed out by good solvent, on the other hand molecule absorb with ionic bonding, which bound tightly cannot be washed away. This washing process can be applied to ensure the consistency of the organoclay.

5.2 Effect of Edge Shielding

The viscosity of a suspended organoclay in solution can be controlled by reducing the edge interaction of the organoclay. A free –OH group on the edge of the clay is reacted with silane coupling agent, octadecyl dimetyl chloro silane or octadecyl trimethoxy silane. A rheological behavior of the organoclay in toluene is improved by shielding the edge of the clay. This is evidenced by a remaining of plastic behavior and a increasing of the yield point without losing the shear thinning behavior.

5.3 Polymer-clay nanocomposite

In order to investigate an effect of organoclay surface treatment on the formation of polymer-clay nanocomposite, two wide used polymer processing techniques were applied. They are melt intercalation and in-situ polymerization. D18 was chosen as the model system. At low surface coverage, both of melt blending and in situ polymerization yield the intercalated nanocomposites. At high surface coverage, the polystyrene cannot penetrate through the interlayer during the melt intercalation process. This is resulting in a formation of conventional composite. In the in situ polymerization, styrene monomer can swell the organoclay and resides within the interlayer. This intercalated monomer can be polymerized, yielding intercalated nanocomposite. The edge shielding has no significant effect for the formation of polystyrene-clay nanocomposites.