CHAPTER V

CONCLUSIONS AND SUGGESTION

5.1 Conclusions

This research studied the effect of three types of filler on properties of the rigid PVC opaque sheet (R-PVCOPS). The R-PVCOPS is a thin and smooth sheet processed by calendering process. Adding the fillers were therefore controlled so that the mechanical and thermal properties were not significantly changed and the product should be smooth after the fillers were added. Talcum, $CaCO_3$ and kaolin at 5, 10 and 20 phr were used as fillers. The effects of fillers on R-PVCOPS mechanical properties, thermal properties and morphology of R-PVCOPS were studied. The results are shown as below.

1. Tensile strength increased when the content of the filler increased. The highest tensile strength of the R-PVCOPS with the mixture of $CaCO_3$/talcum/kaolin was obtained at the ratio of 1 :2.5 :1.5 to the total concentration of 10 phr.
2. For every ratio of each filler added, the tear strength increased when the content of each filler increased but decreased when the total content of filler was higher than 10 phr.
3. Impact strength increased when the content of each filler increased. The highest impact strength of the R-PVCOPS was found in the mixture of $CaCO_3$/talcum at the ratio of 1:1. When the filler content was higher than 20 phr, the impact strength decreased. The mixture of

$CaCO_3$/talcum at the ratio of 1:1 to the total concentration of 10 phr was the best ratio of filler to mix with R-PVCOPS, to produce high quality rigid PVC opaque sheets by calendering process. The processing cost is reduced by 2.6 Baht/kg. Besides, the mechanical and thermal properties were improved compared with R-PVCOPS without fillers.

4. For every ratio of the fillers added, % shrinkage decreased when the content of filler increased. The R-PVCOPS containing the filler $CaCO_3$/talcum was found to give the lowest % shrinkage at the ratio of 1:1.
5. For every ratio of the fillers, HDT increased when the content of filler increased. The HDT would decrease at 20 phr of the fillers. The R-PVCOPS containing the mixed filler of $CaCO_3$/talcum, at the ratio of 1:1, gave the highest HDT at 73.9^0C.
6. The content and ratio of fillers would always affect the mechanical properties and thermal properties. The properties depended on the dispersion of the fillers in the polymer matrix. From SEM micrographs, the best dispersion of fillers into R-PVCOPS was the mixture of $CaCO_3$/talcum at 10 phr.
7. If the content of fillers were the same, but the ratios of fillers were different, the dispersion of fillers in the polymer matrix was always different. The dispersion is controlled by shape and particle size of the fillers.

5.2 Suggestion for further work

1. The relationship between the operating condition and the filler should be studied by varying the content and ratio of fillers.
2. The effect of mechanical properties of R-PVCOPS in the presence of other fillers, such as asbestos, dolomite, barium sulphate, fiber glass, and metal powder, should be pursued.