

CHAPTER V

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

Coating solution was prepared from suspensions of silatrane containing various amounts of GPTS and 3wt% of 3-APS. Organic-inorganic crosslink network was prepared by the sol-gel reaction of silatrane and coupling agent and followed by thermal drying at 60°C for 30 minutes and then heating up to curing film at 120°C for 2 hours. FT-IR was used to confirm the presence of siloxane (Si-O-Si) network in hybrid coating. The PMMA substrate was treated with plasma etching and then dip in the coating solutions. The cured film exhibited excellent optical quality.

The coating films were tested for the adhesion and scratch resistance. For the adhesion test, when the PMMA substrate was treated with plasma, the adhesion between film and substrate was very good. For the steel wool test, the coating solution with GPTS/silatrane ratio of 3 to 10 exhibited the highest scratch resistance. The optical transmittance was used to determine the optical properties of film after steel wool test. The scratch resistance of PMMA substrate coated with silatrane coating solution increased with increasing GPTS content. Thus the hydrolyzed GPTS was absorbed on the silica particle and formed a strong siloxane bonding between particles by condensation reaction, this resulted good scratch resistance to the PMMA substrates.

The findings suggested that an appropriate ratio of GPTS to silatrane, wt% of curing agent, curing time and curing temperature played an important role in improving the scratch resistance of PMMA substrates.

Chu *et al* [25] used colloidal silica in their way. They overcame the immiscibility problem of their mixture by adjusting pH (to 4 or 9.5) and by adding ethanol to their suspensions. Like GPTS solutions, basic conditions in the suspension promoted rapid condensation between silane monomers and oligomers. When the GPTS to silica weight ratio (R) was 0.3 or higher, this rapid condensation resulted in the formation of precipitates which settled over time. Addition of GPTS to an acidified colloidal silica resulted in a uniform suspensions, however, the suspensions clouded over time, indicating aggregation, but, in the present work, use of silatrane as the precursor was not found to have the same problems that Chu *et al.* found.

5.2 Suggestion of further work

1. Prepare the coating solution with other metal alkoxide such as titanium or zirconium.
2. Coat the transparent substrate with this coating solution to improve the scratch resistance such as polyethyleneterephthalate, (PET), polycarbonate, (PC), Ophthalmic lenses.

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